PAMLICO SOUND SURVEY

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ABSTRACT

The primary objective of the Pamlico Sound Survey is to continue the development of a multi-species long-term index of abundance for juvenile fish in Pamlico Sound and its coastal rivers. Samples collected from 2009 - 2013 included 270 samples in June and 270 samples in September. Average salinities were higher in the Pamlico Sound (PDE, PDW, PSE, PSW) strata compared to the river strata (NR, PR, PUR; Table 2.2). Mean surface water temperatures, bottom water temperatures, and surface dissolved oxygen were relatively stable across strata. Mean bottom dissolved oxygen was generally higher in Pamlico Sound strata than river strata. In all strata the bottom composition (e.g. structure) was primarily "no grass", except in 2013 when the bottom composition in the PSW strata was primarily tunicate. In the river strata, the primary sediment types were soft and sandy mud. In the sound, sand was the principal sediment type in shallow strata (PSE and PSW) and soft mud was most prevalent in the deeper strata. In all, 1,022,897 individuals, including 97 finfish species were captured from 540 samples. Spot was the most abundant species by number and accounted for 41.6% of the total catch by number. Target species accounted for 81.7% of the catch by number and included spot (41.6%), Atlantic croaker (35.9%), weakfish (2.1%), blue crab (1.5%), summer flounder (0.4%), and southern flounder (0.2%). Other species of interest included, Atlantic menhaden (1.2%), southern kingfish (0.5%), brown shrimp (1.3%), pink shrimp (0.2%), and white shrimp (0.3%). Cownose rays were the most abundant (<0.1%) of the sharks and rays. Atlantic menhaden, bluefish, southern flounder, spot, and blue crab generally had higher CPUE's in river strata. Butterfish, pigfish, southern kingfish, summer flounder, weakfish, pink shrimp, and white shrimp generally had higher CPUE's in sound strata. Atlantic croaker and brown shrimp had similar CPUE's between river and sound strata. Atlantic croaker was the most abundant target species with an average weighted CPUE of 696.0 individuals per sample while blue crab and brown shrimp were the least abundant target species with an average weighted CPUE of 24.6 individuals per sample. For June, Atlantic croaker, and brown shrimp were significantly correlated with NCDMF P120 annual CPUEs. For September, Atlantic croaker, brown shrimp, and southern flounder were significantly correlated with NCDMF P120 annual CPUEs. Annually, Atlantic croaker, brown shrimp, and southern flounder were significantly correlated with NCDMF Estuarine Trawl Survye (Program 120) annual CPUEs. Data from this project were used in the development and/or revisions of state FMP's for blue crab, southern flounder, and Penaeid shrimp. Data were also used in federal FMP's for Atlantic croaker, Atlantic menhaden, spot, and weakfish. Annual abundance indices are now provided as part of ASMFC compliance reports for Atlantic croaker, Atlantic menhaden, spot, and weakfish.

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INTRODUCTION

The Pamlico Sound Survey began in March 1987 with funding provided by the North Carolina Division of Marine Fisheries (NCDMF) and through the National Marine Fisheries Service (NMFS) through the Southeast Area Monitoring and Assessment Program (SEAMAP). Since 1990, funding has been provided by the U.S. Fish and Wildlife Service through the Sport Fish Restoration Program. Data collected from this survey provide juvenile abundance indices and long-term population parameters for interstate and statewide stock assessments of recreationally and commercially important fish stocks such as Atlantic croaker, spot, and summer flounder.

When sampling began in 1987, it was conducted over two weeks during the months of March, June, September, and December. In 1990, sampling occurred over two weeks during the months of March, June, and September. From 1991 to present, the Pamlico Sound Survey has been conducted during the middle two weeks in June and September. There were six years in which the survey did not occur over the same time series: 1988, 1999, 2003, 2009, 2012, and 2013. In 1988, the December leg of the cruise was partially extended into January 1989 because of scheduling conflicts and adverse weather conditions. In 1999, samples were collected during the month of July and the end of September and October because vessel repairs and hurricanes prevented following the normal schedule. In September 2003, Hurricane Isabel caused a delay and sampling was completed during two days in October. In September 2009, vessel repairs caused a delay and sampling was completed during the first week of October. In June 2012, vessel repairs caused sampling to extend into a third week. In 2013, vessel repairs in June caused sampling to extend into a third week, and in September bad weather and personnel issues caused sampling to extend into a third week.

From 1987 - 1989 the sample area covered all of Pamlico Sound and its bays, Croatan Sound, Roanoke Sound, Albemarle Sound east of a line from the mouth of Alligator River to the mouth of North River, the Pamlico River up to Bath Creek and the Neuse River up to Minnesott Beach. From 1990 - present, the sample area covers all of Pamlico Sound and its bays, Croatan Sound up to the Highway 64 Bridge, the Pamlico River up to Blounts Bay, the Pungo River up to Smith Creek, and the Neuse River up to Upper Broad Creek.

OBJECTIVES

1. To determine annual indices of juvenile abundance for Atlantic croaker (*Micropogonias undulatus*), weakfish (*Cynoscion regalis*), spot (*Leiostomus xanthurus*), southern flounder (*Paralichthys lethostigma*), summer flounder (*Paralichthys dentatus*), and blue crab (*Callinectes sapidus*) in North Carolina.

2. To determine which species use (and to what extent) the sound during their early life development and identify nursery areas for those species (e.g., *Cynoscion* spp., *Paralichthys dentatus*, etc.).

3. To determine if catch rates of various species are correlated with indices of juvenile abundance derived from the estuarine juvenile trawl survey (Program 120).

SAMPLING PROCEDURES

Fifty-four randomly selected stations (one-minute by one-minute grid system equivalent to one square nautical mile) were sampled over two week periods, the second and third weeks of the month in June and September. The stations sampled were randomly selected from strata based upon depth and geographic location. The seven designated strata were: Neuse River (NR); Pamlico River (PR); Pungo River (PUR); Pamlico Sound east of Bluff Shoal, shallow (PSE) and deep (PDE); and Pamlico Sound west of Bluff Shoal, shallow (PSW) and deep (PDW) (Figure 1). Shallow water was considered water between 6-12 feet in depth and deep water was considered water greater than 12 feet in depth.

Tow duration was 20 minutes at 2.5 knots using the R/V Carolina Coast pulling double rigged demersal mongoose trawls. The R/V Carolina Coast is a 44-ft fiberglass hulled double rigged trawler owned and operated by the NCDMF. The body of the trawl is constructed of #9 twine with 1.875-in (47.6-mm) stretch mesh. The cod end of the net is constructed of #30 twine with 1.5-in (38.1-mm) stretch mesh. The tail bag is 80 meshes around and 80 meshes long (approximately 10-ft). A 120-ft (36.58-m) three-lead bridle is attached to each of a pair of wooden, chain doors that measure 4 ft. by 2 ft. (1.22-m X 0.61-m) and to a tongue centered on the head-rope. A 60-cm “poly ball” is attached between the end of the tongue and the tongue bridle cable. A 0.1875-in (4.76-mm) tickler chain that is 3.0-ft (0.9-m) shorter than the 34-ft (10.36-m) foot rope is connected to the door next to the footrope.

Physical and environmental conditions such as temperature (^{o}C), salinity (ppt), dissolved oxygen (mg/L), bottom composition, a qualitative assessment of sediment size, and water clarity (began 2008) were recorded at the end of each tow.

All species were sorted and a total number and weight was recorded for each species. For target species 30-60 individuals were measured and total weights were measured. Selected species (spot, Atlantic croaker, bluefish, southern flounder, southern kingfish), were retained and taken to the lab where age structures were removed and sex and maturity stage of gonads were determined. Age data is used in stock assessments and in determining length cut-offs for young-of-year fish.

ANALYSES

All analyses were conducted with SAS (SAS Institute 2012). Data were collected between July 1, 2009 and June 30, 2014 however, the results in this report are summarized annually based on the calendar years of 2009 to 2013 in order to coincide with existing monitoring programs and to allow the results to be more consistent with most stock assessments. Samples reported in the results were obtained from cruises conducted in June and September from 2009 - 2013.

ENVIRONMENTAL DATA

Descriptive statistics (mean, standard error, minimum, and maximum) were calculated for temperature, salinity, and dissolved oxygen for each stratum by sample year and overall.

Bottom substrate and sediment size were summarized for each stratum by year based on samples taken at each station at the end of each sample tow.

SPECIES COMPOSITION

Overall species composition by number and weight was summarized for all species captured from 2009 - 2013.

HABITAT USE

CPUE estimates were used to determine differences between catch rates of target species in coastal rivers and shallow (6-12 ft.) and deep water (>12 ft.) areas of Pamlico Sound. Catch rates calculated by stratum and year were used to evaluate the availability of target species by stratum.

CALCULATION OF WEIGHTED CPUE ESTIMATES BY SIZE CLASS

Catch rates of target species were calculated annually and expressed as an overall weighted CPUE along with corresponding mean lengths and size ranges. The overall weighted CPUE provides a relative index of abundance showing availability of each species to the study. The overall weighted CPUE was expressed as the number of individuals of a species captured per sample. Due to disproportionate sizes of each stratum, the final CPUE estimate was weighted. The total area of each stratum was quantified using the one-minute by one-minute grid system and used to weigh the observed catches to calculate the overall abundance indices. The weighting factors by stratum are:

Pamlico River: 64.0 square nautical miles

Pungo River: 18.0 square nautical miles

Neuse River: 93.0 square nautical miles

Pamlico Shallow West: 135.0 square nautical miles

Pamlico Deep West: 312.0 square nautical miles

Pamlico Shallow East: 206.0 square nautical miles

Pamlico Deep East: 554.0 square nautical miles

CORRELATION OF YOY CATCHES WITH NCDMF ESTUARINE JUVENILE TRAWL SURVEY

The juvenile abundance index (JAI) is the mean (weighted by strata) number of individuals per sample for young of the year (YOY). Age-length frequency distributions were examined to determine the size range for YOY of each species. YOY size ranges for each species were

determined as follows: Atlantic croaker <140 mm TL in June and <200 mm TL in September; Atlantic menhaden <110 mm FL in June and <150 mm FL in September; weakfish <140 mm FL in June and <200 mm FL in September; spot <110 mm FL in June and <130 mm FL in September; summer flounder <171 mm TL in June and <230 mm TL in September; southern flounder <160 mm TL in June and <230 mm TL in September; and blue crab ≥ 30 mm and <100 mm carapace width (CW). Pamlico Sound Survey (PSS) indices were compared to the divisions Estuarine Juvenile Trawl Survey (Program 120). Data from 1987 - 2013 has been included in this report to show the long term trends of each index. Correlation matrices were constructed to compare trends in YOY abundance for Atlantic croaker, Atlantic menhaden, blue crab, brown shrimp, southern flounder, spot, summer flounder, and weakfish between the PSS and the NCDMF estuarine juvenile trawl survey (P120). A Pearson correlation was used to test for correlation by month and annually with the NCDMF P120 trawl survey.

RESULTS AND DISCUSSION

SAMPLING

Samples collected from 2009-2013 included 270 samples in June and 270 samples in September (Table 1).

ENVIRONMENTAL DATA

From 2009 - 2013 average salinities were higher in the Pamlico Sound (PDE, PDW, PSE, PSW) strata compared to the river strata (NR, PR, PUR) (Table 2). This is generally expected given the Pamlico Sound is influenced by ocean water passing through coastal inlets and the rivers receive freshwater input from runoff. Mean surface water temperatures, bottom water temperatures, and surface dissolved oxygen were relatively stable across strata. Mean bottom dissolved oxygen ranged from 4.5 mg/L in the Neuse River strata to 6.5 mg/L in the Pamlico deep east strata and the Pamlico shallow west strata and was generally higher in Pamlico Sound strata then river strata (Table 2).

The bottom substrate and sediment size was sampled to characterize habitat data spatially throughout the sampling area. For all strata the bottom composition (e.g. structure) was primarily “no grass”, meaning there was a general lack of bottom structure, except in 2013 when the bottom composition in the PSW strata was primarily tunicate. In the river strata, the primary sediment types were soft and sandy mud. In the sound, sand was the principal sediment type in shallow strata (PSE and PSW) and soft mud was most prevalent in the deeper strata (Table 3).

SPECIES COMPOSITION

In all, 1,022,897 individuals, including 97 finfish species were captured from 540 samples from 2009 - 2013 (Tables 4). Spot was the most abundant species by number and accounted for 41.6% of the total catch by number. Target species accounted for 81.7% of the catch by number and included spot (41.6%), Atlantic croaker (35.9%), weakfish (2.1%), blue crab (1.5%) summer flounder (0.4%), and southern flounder (0.2%). Other species of interest included brown shrimp (1.3%), Atlantic menhaden (1.2%), southern kingfish (0.5%), pink shrimp (0.2%),

and white shrimp (0.3%). Cownose rays were the most abundant (<0.1%) of the sharks and rays caught from 2009 - 2013 (Table 4).

SPECIES HABITAT USE

Mean weighted CPUE's for selected species were compared between river and sound strata to assess habitat use from 2009 - 2013. Atlantic menhaden (PR), bluefish (PR), southern flounder (PUR), spot (PUR), and blue crab (PR) generally had higher CPUE's in river strata. Butterfish (PDE), pigfish (PSE), southern kingfish (PSW), summer flounder (PSE), weakfish (PDE), pink shrimp (PDE), and white shrimp (PDE) generally had higher CPUE's in sound strata. Atlantic croaker (PDE) and brown shrimp (PDW) had similar CPUE's between river and sound strata (Table 5).

WEIGHTED CPUE ESTIMATES AND SIZE DISTRIBUTION

Atlantic croaker was the most abundant target species with an average weighted CPUE of 696.0 individuals per sample (Table 6). Lengths ranged from 51-338 mm TL with a mean size of 124.7 mm TL. Atlantic croaker length frequency distribution had a single modal peak at the 120 mm TL size class in 2010, 2012, and 2013 and the 140 mm TL size class in 2009. The length frequency distribution had bimodal peaks at the 100 and 160 mm TL size classes in 2011 (Figure 2)

Spot was the second most abundant target species with an average weighted CPUE of 690.2 individuals per sample (Table 6). Lengths ranged from 16-382 mm FL with a mean size of 101.5 mm FL. Spot length frequency distribution had a single modal peak at the 80 mm FL size class in 2009, 2010, 2012, and 2013. The length frequency distribution had bimodal peaks at the 80 and 120 mm FL size classes in 2011 (Figure 3).

Weakfish was the third most abundant target species with an average weighted CPUE of 43.5 individuals per sample (Table 6). Lengths ranged from 16-378 mm TL with a mean size of 171.6 mm TL. Weakfish length frequency distribution had a single modal peak at the 140 mm TL size class in 2009, and the 180 mm TL size class in 2010. The length frequency distribution had bimodal peaks at the 120 and 180 mm TL size classes in 2011 and the 140 and 180 mm TL size classes in 2012 and 2013 (Figure 4).

Blue crab was the fourth most abundant target species with an average weighted CPUE of 24.6 individuals per sample (tied with brown shrimp; Table 6). Lengths ranged from 15-200 mm CW with a mean size of 79.2 mm CW. Blue crab length frequency distribution had a single modal peak at the 40 mm CW size class in 2009, 2010, 2012 and 2013, the 60 mm CW size class in 2011 (Figure 5).

Brown shrimp was the fourth most abundant target species with an average weighted CPUE of 24.6 individuals per sample (tied with blue crab; Table 6). Lengths ranged from 41-196 mm TL with a mean size of 111.6 mm TL. Brown shrimp length frequency distribution had a single modal peak at the 80 mm TL size class in 2010, the 100 mm size TL size class in 2009, and 2013, and the 120 mm TL size class in 2011 and 2012 (Figure 6).

Pigfish had an average weighted CPUE of 13.9 individuals per sample (Table 6). Lengths ranged from 53-298 mm FL with a mean size of 132.8 mm FL. Pigfish length frequency distribution had a single modal peak at the 120 mm FL size class in 2009, 2010, 2012 and 2013, The length frequency distribution had bimodal peaks at the 60 and 120 mm FL size classes in 2011 (Figure 7).

Atlantic menhaden had an average weighted CPUE of 13.2 individuals per sample (Table 6). Lengths ranged from 13-250 mm FL with a mean size of 98.8 mm FL. Atlantic menhaden length frequency distribution had a single modal peak at the 80 mm FL size class in 2012. The length frequency distribution had bimodal peaks at the 100 and 140 mm FL size classes in 2009, the 60 and 140 mm FL size classes in 2010, the 80 and 120 mm FL size classes in 2011 and the 40 and 140 mm FL size classes in 2013 (Figure 8).

Southern kingfish had an average weighted CPUE of 10.4 individuals per sample (Table 6). Lengths ranged from 44-383 mm TL with a mean size of 172.6 mm TL. Southern kingfish length frequency distribution had bimodal peaks at the 140 and 180 mm TL size classes in 2009, the 100 and 180 mm TL size classes in 2010, the 140 and 220 mm TL size classes in 2011, the 160 and 200 mm TL size classes in 2012, and the 120 and 180 mm TL size classes in 2013 (Figure 9).

Summer flounder had an average weighted CPUE of 9.2 individuals per sample (Table 6). Lengths ranged from 46-490 mm TL with a mean size of 154.5 mm TL. Summer flounder length frequency distribution had a single modal peak at the 100 mm TL size class in 2010. The length frequency distribution had bimodal peaks at the 100 and 200 mm TL size classes in 2009, the 100 and 180 mm TL size classes in 2011, the 120 and 180 mm TL size classes in 2012, and the 80 and 180 mm TL size classes in 2013 (Figure 10).

White shrimp had an average weighted CPUE of 6.6 individuals per sample (Table 6). Lengths ranged from 16-198 mm TL with a mean size of 134.4 mm TL. White shrimp length frequency distribution had a single modal peak at the 120 mm TL size class in 2009, 2010, and 2013, and the 140 mm TL size class in 2011, and 2012 (Figure 11).

Pink shrimp had an average weighted CPUE of 4.7 individuals per sample (Table 6). Lengths ranged from 64-185 mm TL with a mean size of 111.6 mm TL. Pink shrimp length frequency distribution had a single modal peak at the 100 mm TL size class in 2009, 2010, 2011, and 2013, and at the 120 mm TL size class in 2012 (Figure 12).

Butterfish had an average weighted CPUE of 3.8 individuals per sample (Table 6). Lengths ranged from 27-192 mm FL with a mean size of 113.7 mm FL. Butterfish length frequency distribution had a single modal peak at the 80 mm FL size class in 2010, the 100 mm FL size class in 2013, and the 120 mm FL size class in 2009, and 2012. The length frequency distribution had bimodal peaks at the 60 and 140 mm FL size classes in 2011 (Figure 13).

Southern flounder had an average weighted CPUE of 3.3 individuals per sample (Table 6). Lengths ranged from 41-467 mm TL with a mean size of 159.3 mm TL. Southern flounder length frequency distribution had bimodal peaks at the 120 and 280 mm TL size classes in 2009, the 140 and 220 mm TL size classes in 2010, the 120 and 320 mm TL size classes in 2011, the 140 and 300 mm TL size classes in 2012, and the 100 and 340 mm TL size classes in 2013 (Figure 14).

Bluefish had an average weighted CPUE of 1.3 individuals per sample (Table 6). Lengths ranged from 69-311 mm FL with a mean size of 175.2 mm FL. Bluefish length frequency distribution had a single modal peak at the 160 mm FL size class in 2011. The length frequency distribution had bimodal peaks at the 140 and 200 mm FL size classes in 2009, the 140 and 260 mm FL size classes in 2010, the 180 and 300 mm FL size classes in 2012, and the 100 and 180 mm FL size classes in 2013 (Figure 15).

CORRELATION OF YOY CATCHES WITH NCDMF ESTUARINE JUVENILE TRAWL SURVEY

Correlations were performed by month and annually for select species using yearly JAIs (Table 7) from 1987 – 2013. For June, Atlantic croaker ($p = 0.01$), and brown shrimp ($p = 0.02$) were significantly correlated with NCDMF P120 annual CPUEs. For September, Atlantic croaker ($p = 0.02$), brown shrimp ($p < 0.01$), and southern flounder ($p = 0.04$) were significantly correlated with NCDMF P120 annual CPUEs. Annually, Atlantic croaker ($p = 0.01$), brown shrimp ($p < 0.01$), and southern flounder ($p = 0.05$) were significantly correlated with NCDMF P120 annual CPUEs (Table 8).

PROTECTED SPECIES INTERACTIONS

Cumulative sea turtle and Atlantic sturgeon interactions from 1987 - 2013 are given in Table 9. This project operates under a TED exemption issued by the National Marine Fisheries Service in 1995. A single Kemp's ridley sea turtle is the only endangered species interaction that occurred from 2009 - 2013.

CONCLUSIONS

The primary objective of this project was to continue the development of a multi-species long-term index of abundance for juvenile fish in Pamlico Sound and its coastal rivers. Data in the current study were used to calculate abundance indices for several recreationally and commercially significant species in Pamlico Sound, including Atlantic croaker, blue crab, southern flounder, spot, summer flounder, and weakfish.

Juvenile abundance indices (JAIs) are annually produced for Atlantic croaker, southern flounder, spot, summer flounder, and weakfish using data from this project. These JAIs have been used in both state and federal stock assessments and management plans. This project also evaluates potential nursery areas in Pamlico Sound used by these species during their early life development.

This project supports and validates a NCDMF upper estuary juvenile monitoring program (Program 120). Correlations between catch rates for several species were evaluated for the two programs. Significant correlations were found for several species including: Atlantic croaker, brown shrimp, and southern flounder.

RECOMMENDATIONS

- The Pamlico Sound Survey should continue in order to provide indices of abundance for several species to be used in future stock assessments.
- Consider expanding the survey by adding an additional cruise at the end of July/beginning of August to increase temporal coverage.
- Collection of age structures should continue with an effort to ensure a representative sample of all size ranges for target species.
- Continue to collect and evaluate data on habitat use by target species.
- Continue to validate JAIs by comparing them with other available data sets.

BENEFITS

Data from this project were used in the development and/or revisions of state FMP's for blue crab, southern flounder, and Penaeid shrimp. Data were also used in federal FMP's for Atlantic croaker, Atlantic menhaden, spot, and weakfish. Annual abundance indices are now provided as part of ASMFC compliance reports for Atlantic croaker, Atlantic menhaden, spot, and weakfish. This project also provides fishery-independent data used to tune stock assessments. Recent stock assessments for Atlantic croaker (2010), Atlantic menhaden (2012), and weakfish (2009) have incorporated indices from this survey into their assessments.

A long-term survey can be used as a standard to identify potential changes in stock abundance as a result of fishing regulations or environmental events. Traditional fisheries management relies on single-species stock assessments to evaluate the status of a stock. This data can be used for this approach but can also be used in a multi-species approach meant to examine the relationships between species.

This project supplemented existing life history studies for various species. It provided age structures and individual fish information on growth and reproduction for Atlantic croaker, bluefish, southern flounder, southern kingfish, Spanish mackerel, spot, spotted seatrout, summer founder, and weakfish.

Data gathered on habitat and bycatch from this survey aids in the management of the inshore shrimp trawl fishery in Pamlico Sound. Continued collection of environmental information will be useful in long-term investigations of habitat use for species using Pamlico Sound as a nursery area. This information can be especially important in monitoring habitat use changes after natural events, such as hurricanes and periods of drought.

Table 1. Trawl samples collected from June and September from 2009-2013 for the Pamlico Sound Survey. A sample consisted of paired mongoose trawls towed for 20 minutes. Results are broken down by month and strata.

Month	Strata	Number of Samples
June	PR	25
	PUR	15
	NR	25
	PSW	25
	PDW	45
	PSE	35
	PDE	100
Total		270
September	PR	25
	PUR	15
	NR	25
	PSW	25
	PDW	45
	PSE	35
	PDE	100
Total		270
Grand Total		540

Table 2. Environmental data collected from 2009 - 2013 by year and strata from the Pamlico Sound Survey.

			Depth (m)		Surface Salinity (ppt)		Bottom Salinity (ppt)		Surface Temperature (˚C)		Bottom Temperature (˚C)		Surface Dissolved Oxygen (mg/L)		Bottom Dissolved Oxygen (mg/L)	
Year	Strata	N	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
2009	NR	10	4.7	0.3	18.4	1	19	0.6	24.9	0.6	24.3	0.4	7.2	0.4	6.6	0.3
	PDE	40	4.6	0.2	23.3	0.5	23.8	0.4	24.4	0.3	24.2	0.3	7.2	0.1	7.1	0.1
	PDW	18	5	0.2	23.2	0.4	23.6	0.3	24.7	0.4	24.6	0.4	6.9	0.1	6.7	0.2
	PR	10	5	0.5	17.5	0.9	17.8	0.8	24	0.7	23.8	0.7	7	0.2	6.6	0.2
	PSE	14	3.3	0.1	21.7	1.2	22.8	1	24.5	0.6	24.3	0.6	7	0.1	6.8	0.1
	PSW	10	3.1	0.2	23.8	0.4	23.8	0.4	24.6	0.8	23.9	0.6	6.9	0.2	6.8	0.2
	PUR	6	4.1	0.4	16.9	1	17	1	23.9	1.2	23.7	1.3	6.8	0.1	6.7	0.2
2010	NR	9	4.7	0.3	12	1.2	13.6	1	26.6	0.3	26.3	0.2	7.1	0.2	5.8	0.4
	PDE	40	5	0.1	18.8	0.7	18.9	0.9	26.8	0.3	26.3	0.3	7	0.1	6.6	0.1
	PDW	18	4.8	0.2	17.2	1.3	18.7	0.7	25.8	1.6	26.4	0.3	6.8	0.4	6.4	0.1
	PR	10	4	0.2	9.4	1.1	9.7	1.1	27.7	0.7	27.1	0.6	7.3	0.2	5.9	0.5
	PSE	14	3.1	0.1	17.4	1	18.9	0.7	26.9	0.5	26.3	0.4	6.8	0.1	6.2	0.3
	PSW	10	3.3	0.2	17.1	0.9	17.7	0.8	26.7	0.6	26.4	0.6	7.1	0.2	6.4	0.2
	PUR	6	3.8	0.2	10.4	1.2	11.3	1	27.7	0.7	26.9	0.6	7	0.4	4.8	0.6
2011	NR	10	4.3	0.4	13.4	2.2	21.4	1	25.4	2.8	27.1	0.2	6	0.7	2.8	0.8
	PDE	40	5	0.2	22.6	0.7	24.9	0.4	26.3	0.2	26	0.2	7.1	0.1	6.5	0.2
	PDW	18	4.6	0.3	22.3	0.5	24.3	0.5	27.2	0.4	26.4	0.3	7.4	0.1	5	0.4
	PR	10	4.7	0.4	12.5	0.8	16.4	1	26.2	0.6	25.7	0.6	8.6	0.6	3.3	0.4
	PSE	14	3.4	0.2	22.4	1.6	24	1.3	26.1	0.4	26.2	0.3	7	0.1	5.7	0.5
	PSW	10	3.5	0.3	22	0.6	22.8	0.6	26.1	0.7	25.7	0.6	7.4	0.2	6.1	0.4
	PUR	6	4.1	0.2	12.9	0.7	16.4	1.2	25.6	0.8	25.3	0.9	7.1	0.4	4.5	0.6
2012	NR	10	5	0.4	13.7	1.6	21	1.2	25.9	0.3	25.4	0.6	7	0.5	3.1	0.6
	PDE	40	4.7	0.2	22.3	0.3	23.9	0.3	24.1	0.2	23.2	0.1	7.9	0.1	6.5	0.2
	PDW	18	5.2	0.3	20.5	0.6	22.1	0.5	25.4	0.2	25	0.2	7.1	0.2	6.2	0.3
	PR	10	5.2	0.6	11.7	1	16.9	0.6	25.7	0.3	25.9	0.2	7.7	0.3	3.1	0.9
	PSE	14	3.3	0.2	21.3	1	23.5	0.8	24	0.4	23.4	0.3	7.6	0.3	6.7	0.3
	PSW	10	3.6	0.3	22.2	0.8	22.6	0.8	25.7	0.2	25.4	0.2	7	0.2	6.5	0.5

Year	Strata	N	Depth (m)		Surface Salinity (ppt)		Bottom Salinity (ppt)		Surface Temperature (˚C)		Bottom Temperature (˚C)		Surface Dissolved Oxygen (mg/L)		Bottom Dissolved Oxygen (mg/L)	
			Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE	Mean	SE
	PUR	6	4.8	0.3	12.8	0.5	15.8	0.9	26.2	0.7	26.2	0.2	7.5	0.5	3.5	0.5
	NR	10	4.5	0.4	14.8	1.1	16.8	0.5	26.7	0.3	26.1	0.1	7.8	0.3	4.4	1
	PDE	40	4.9	0.2	22.2	0.6	22.9	0.6	25.8	0.2	25.2	0.2	7.1	0.1	6.1	0.3
	PDW	18	4.8	0.2	22.1	0.8	24.8	1.2	26.2	0.3	25.8	0.3	7.1	0.1	6.2	0.2
2013	PR	10	4.6	0.4	13.7	2	14.5	2.1	24.3	0.6	24.3	0.6	7.7	0.2	7.1	0.2
	PSE	14	2.7	0.2	17	1.9	18.9	2	25.2	0.7	24.8	0.5	7.4	0.1	6.1	0.5
	PSW	10	2.9	0.2	23.6	0.9	25.5	1.9	25.3	0.7	24.9	0.6	7.1	0.1	6.9	0.2
	PUR	6	4	0.6	13.9	1.3	14.1	1.3	24.4	1	24.5	1	7.2	0.1	6.9	0.2
	NR	49	4.6	0.2	14.5	0.7	18.5	0.6	25.9	0.6	25.8	0.2	7	0.2	4.5	0.4
	PDE	200	4.8	0.1	21.8	0.3	22.9	0.3	25.5	0.1	25	0.1	7.3	0	6.5	0.1
	PDW	90	4.9	0.1	21.1	0.4	22.7	0.4	25.9	0.3	25.6	0.2	7.1	0.1	6.1	0.1
All	PR	50	4.7	0.2	13	0.7	15	0.7	25.6	0.3	25.4	0.3	7.7	0.2	5.2	0.3
	PSE	70	3.2	0.1	19.9	0.7	21.6	0.6	25.3	0.3	25	0.2	7.2	0.1	6.3	0.2
	PSW	50	3.3	0.1	21.7	0.5	22.5	0.6	25.7	0.3	25.3	0.3	7.1	0.1	6.5	0.1
	PUR	30	4.2	0.2	13.4	0.6	14.9	0.6	25.6	0.5	25.3	0.4	7.1	0.1	5.3	0.3

* In NR strata in 2010 only surface and bottom temperature were taken at on station.

Table 3. Bottom composition and sediment size summary for the Pamlico Sound Survey from 2009 - 2013.

		Strata													
		NR		PR		PUR		PDE		PDW		PSE		PSW	
Year	Habitat Type	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2009	Bottom Composition														
	Bryozoan	.	.	.	.	.	.	2	5	1	5.56	1	7.14	.	.
	grass	.	.	.	.	.	.	3	7.5	.	.	3	21.43	.	.
	no grass	9	90	10	100	6	100	26	65	15	83.33	6	42.86	7	70
	Tunicate	.	.	.	.	.	.	5	12.5	2	11.11	3	21.43	3	30
	detritus	1	10	.	.	.	.	1	2.5	.	.	.	.	.	
	algae	.	.	.	.	.	.	3	7.5	.	.	1	7.14	.	.
	Sediment Size														
	muddy sand	3	30	.	.	.	.	7	17.5	6	33.33	2	14.29	2	20
	sand	.	.	.	.	1	16.67	12	30	5	27.78	10	71.43	5	50
	sandy mud	2	20	.	.	.	.	10	25	1	5.56	1	7.14	2	20
	soft mud	5	50	10	100	5	83.33	11	27.5	6	33.33	1	7.14	1	10
2010	Bottom Composition														
	Bryozoan	.	.	.	.	.	.	1	2.5	.	.	.	.	.	.
	grass	.	.	.	.	.	.	5	12.5	1	5.56	1	7.14	.	.
	no grass	9	90	10	100	6	100	22	55	12	66.67	6	42.86	4	40
	shell	1	10	.	.	.	.	.	.	.	.	1	7.14	3	30
	shell, grass	.	.	.	.	.	.	.	.	1	5.56	.	.	.	.
	Tunicate	.	.	.	.	.	.	8	20	4	22.22	2	14.29	3	30
	detritus	.	.	.	.	.	.	2	5	.	.	3	21.43	.	.
	shell, detritus	.	.	.	.	.	.	2	5	.	.	1	7.14	.	.
	Sediment Size														
	muddy sand	.	.	.	.	.	.	10	25	3	16.67	5	35.71	.	.
	sand	.	.	.	.	.	.	5	12.5	2	11.11	4	28.57	7	70
	sandy mud	4	40	3	30	3	50	6	15	8	44.44	2	14.29	2	20
	soft mud	6	60	7	70	3	50	19	47.5	4	22.22	3	21.43	1	10
	hard mud	.	.	.	.	.	.	.	.	1	5.56	.	.	.	.

Table 3. Continued...

		Strata													
		NR		PR		PUR		PDE		PDW		PSE		PSW	
Year	Habitat Type	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2011	Bottom Composition														
	Bryozoan	.	.	.	.	.	.	1	2.5	.	.	2	14.29	.	.
	grass	.	.	.	.	.	.	1	2.5	3	16.67	2	14.29	.	.
	grass, algae	.	.	.	.	.	.	.	.	.	.	1	7.14	.	.
	no grass	10	100	10	100	6	100	34	85	13	72.22	9	64.29	7	70
	shell	.	.	.	.	.	.	1	2.5	1	5.56	.	.	3	30
	shell, grass	.	.	.	.	.	.	.	.	1	5.56	.	.	.	.
	Tunicate	.	.	.	.	.	.	3	7.5	.	.	.	.	.	.
	Sediment Size														
	mud	.	.	.	.	.	.	.	.	1	5.88	.	.	.	.
	muddy sand	.	.	2	20	.	.	2	5.13	4	23.53	2	14.29	1	11.11
	sand	2	20	.	.	.	.	14	35.9	1	5.88	10	71.43	4	44.44
	sandy mud	3	30	3	30	3	50	5	12.82	3	17.65	2	14.29	2	22.22
	soft mud	5	50	5	50	3	50	18	46.15	8	47.06	.	.	2	22.22
2012	Bottom Composition														
	Bryozoan	.	.	.	.	.	.	.	.	.	.	.	.	1	10
	grass	.	.	.	.	.	.	1	2.5	.	.	2	14.29	.	.
	grass, algae	.	.	.	.	.	.	1	2.5	.	.	.	.	.	.
	no grass	10	100	10	100	5	83.33	34	85	16	88.89	10	71.43	7	70
	shell	.	.	.	.	1	16.67	2	5	2	11.11	1	7.14	.	.
	Tunicate	.	.	.	.	.	.	2	5	.	.	1	7.14	2	20
	Sediment Size														
	muddy sand	.	.	.	.	.	.	4	10	1	5.56	2	14.29	2	20
	sand	.	.	.	.	.	.	9	22.5	1	5.56	10	71.43	3	30
	sandy mud	2	20	1	10	1	16.67	8	20	6	33.33	1	7.14	3	30
	soft mud	8	80	9	90	5	83.33	19	47.5	10	55.56	1	7.14	2	20

Table 3. Continued...

		Strata													
		NR		PR		PUR		PDE		PDW		PSE		PSW	
Year	Habitat Type	N	%	N	%	N	%	N	%	N	%	N	%	N	%
2013	Bottom Composition														
	grass	.	.	.	.	.	.	1	2.5	.	.	.	.	.	.
	no grass	10	100	10	100	6	100	30	75	9	50	9	64.29	4	40
	shell	.	.	.	.	.	.	.	.	5	27.78	2	14.29	.	.
	shell, grass	.	.	.	.	.	.	.	.	.	.	1	7.14	.	.
	Tunicate	.	.	.	.	.	.	9	22.5	3	16.67	2	14.29	6	60
	algae	.	.	.	.	.	.	.	.	1	5.56	.	.	.	.
	Sediment Size														
	mud	.	.	.	.	.	.	8	21.62	.	.	1	7.14	1	10
	muddy sand	2	20	.	.	.	.	4	10.81	6	37.5	7	50	2	20
	sand	2	20	.	.	.	.	8	21.62	4	25	3	21.43	7	70
	sandy mud	3	30	3	30	.	.	.	.	.	.	.	.	.	.
	soft mud	2	20	7	70	6	100	17	45.95	6	37.5	3	21.43	.	.
	hard mud	1	10	.	.	.	.	.	.	.	.	.	.	.	.

Table 4. Overall species composition for the Pamlico Sound Survey from 2009 - 2013.

Species	Common Name	Number		Biomass (kg)	
		Total	%	Total	%
Finfish					
Leiostomus xanthurus	Spot	425,942	41.6	7,617.6	27.7
Micropogonias undulatus	Atlantic Croaker	367,449	35.9	7,635.7	27.8
Lagodon rhomboides	Pinfish	71,066	6.9	2,366.1	8.6
Cynoscion regalis	Weakfish	21,579	2.1	1,077.0	3.9
Anchoa mitchilli	Bay Anchovy	14,609	1.4	19.8	0.1
Bairdiella chrysoura	Silver Perch	13,358	1.3	479.2	1.7
Brevoortia tyrannus	Atlantic Menhaden	12,147	1.2	265.5	1.0
Orthopristis chrysoptera	Pigfish	6,693	0.7	285.3	1.0
Anchoa hepsetus	Striped Anchovy	6,205	0.6	64.3	0.2
Menticirrhus americanus	Southern Kingfish	5,080	0.5	262.4	1.0
Opisthonema oglinum	Atlantic Thread Herring	4,695	0.5	72.9	0.3
Paralichthys dentatus	Summer Flounder	4,527	0.4	200.1	0.7
Trinectes maculatus	Hogchoker	4,337	0.4	112.8	0.4
Peprilus paru	Harvestfish	3,138	0.3	214.8	0.8
Chaetodipterus faber	Atlantic Spadefish	2,599	0.3	136.7	0.5
Synodus foetens	Inshore Lizardfish	2,383	0.2	173.9	0.6
Paralichthys lethostigma	Southern Flounder	2,221	0.2	132.6	0.5
Peprilus triacanthus	Butterfish	1,840	0.2	87.1	0.3
Pomatomus saltatrix	Bluefish	971	0.1	83.4	0.3
Citharichthys spilopterus	Bay Whiff	876	0.1	20.0	0.1
Etropus crossotus	Fringed Flounder	714	0.1	14.0	0.1
Eucinostomus gula	Silver Jenny	681	0.1	9.4	<0.1
Chloroscombrus chrysurus	Atlantic Bumper	669	0.1	6.6	<0.1
Prionotus evolans	Striped Searobin	576	0.1	17.4	0.1
Trichiurus lepturus	Atlantic Cutlassfish	510	<0.1	51.4	0.2
Dorosoma cepedianum	Gizzard Shad	500	<0.1	9.1	<0.1
Selene setapinnis	Atlantic Moonfish	373	<0.1	3.4	<0.1
Stephanolepis hispidus	Planehead Filefish	335	<0.1	6.4	<0.1
Prionotus scitulus	Leopard Searobin	322	<0.1	8.7	<0.1
Chilomycterus schoepfii	Striped Burrfish	305	<0.1	88.3	0.3
Urophycis regia	Spotted Hake	289	<0.1	10.8	<0.1
Scomberomorus maculatus	Spanish Mackerel	207	<0.1	17.2	0.1
Selene vomer	Lookdown	194	<0.1	4.3	<0.1
Caranx hippos	Crevalle Jack	173	<0.1	7.0	<0.1
Sphoeroides maculatus	Northern Puffer	150	<0.1	19.4	0.1
Symphurus plagiusa	Blackcheek Tonguefish	126	<0.1	3.2	<0.1
Prionotus carolinus	Northern Searobin	122	<0.1	3.2	<0.1
Larimus fasciatus	Banded Drum	91	<0.1	8.8	<0.1

Table 4. Continued...

Species	Common Name	Number		Biomass (kg)	
		Total	%	Total	%
Finfish					
Archosargus probatocephalus	Sheepshead	64	<0.1	54.7	0.2
Trachinotus carolinus	Florida Pompano	51	<0.1	8.5	<0.1
Ancylopsetta quadrocellata	Ocellated Flounder	43	<0.1	2.2	<0.1
Paralichthys oblongus	Fourspot Flounder	40	<0.1	1.3	<0.1
Centropristis philadelphica	Rock Sea Bass	38	<0.1	1.6	<0.1
Alectis ciliaris	African Pompano	25	<0.1	0.1	<0.1
Stenotomus chrysops	Scup	21	<0.1	0.3	<0.1
Cynoscion nebulosus	Spotted Seatrout	20	<0.1	1.3	<0.1
Paralichthys albigutta	Gulf Flounder	20	<0.1	1.8	<0.1
Scophthalmus aquosus	Windowpane	19	<0.1	0.7	<0.1
Lutjanus griseus	Gray Snapper	18	<0.1	0.4	<0.1
Syngnathus louisianae	Chain Pipefish	17	<0.1	0.2	<0.1
Hippocampus erectus	Lined Seahorse	13	<0.1	0.1	<0.1
Lepisosteus osseus	Longnose Gar	12	<0.1	21.0	0.1
Diplodus holbrookii	Spottail Pinfish	12	<0.1	0.3	<0.1
Opsanus tau	Oyster Toadfish	11	<0.1	0.8	<0.1
Menidia menidia	Atlantic Silverside	10	<0.1	0.0	<0.1
Menticirrhus saxatilis	Northern Kingfish	9	<0.1	0.6	<0.1
Glyptocephalus cynoglossus	Witch Flounder	9	<0.1	0.2	<0.1
Centropristis striata	Black Sea Bass	8	<0.1	0.3	<0.1
Stenotomus caprinus	Longspine Porgy	8	<0.1	0.2	<0.1
Cynoscion nothus	Silver Seatrout	7	<0.1	0.5	<0.1
Rachycentron canadum	Cobia	5	<0.1	5.1	<0.1
Menidia beryllina	Inland Silverside	4	<0.1	0.1	<0.1
Syngnathus spp.	Syngnathus Pipefishes	4	<0.1	0.0	<0.1
Pogonias cromis	Black Drum	4	<0.1	0.6	<0.1
Monacanthus tuckeri	Slender Filefish	4	<0.1	0.1	<0.1
Alosa mediocris	Hickory Shad	3	<0.1	0.8	<0.1
Sphyraena borealis	Northern Sennet	3	<0.1	0.1	<0.1
Citharichthys macrops	Spotted Whiff	3	<0.1	0.1	<0.1
Aluterus schoepfii	Orange Filefish	3	<0.1	0.1	<0.1
Syngnathus floridae	Dusky Pipefish	2	<0.1	<0.1	<0.1
Morone saxatilis	Striped Bass	2	<0.1	0.1	<0.1
Caranx crysos	Blue Runner	2	<0.1	0.1	<0.1
Sphyraena guachancho	Guaguanche	2	<0.1	0.1	<0.1
Chasmodes bosquianus	Striped Blenny	2	<0.1	<0.1	<0.1
Elops saurus	Ladyfish	1	<0.1	0.2	<0.1
Ameiurus catus	White Catfish	1	<0.1	1.8	<0.1

Table 4. Continued...

Species	Common Name	Number		Biomass (kg)	
		Total	%	Total	%
Finfish					
Gobiesox strumosus	Skilletfish	1	<0.1	<0.1	<0.1
Ophidiidae	Cusk-eels	1	<0.1	<0.1	<0.1
Membras martinica	Rough Silverside	1	<0.1	<0.1	<0.1
Menidia spp.	Menidia Silversides	1	<0.1	<0.1	<0.1
Fistularia tabacaria	Bluespotted Cornetfish	1	<0.1	<0.1	<0.1
Scorpaena brasiliensis	Barbfish	1	<0.1	<0.1	<0.1
Prionotus spp.	Prionotus Searobins	1	<0.1	0.1	<0.1
Remora remora	Remora	1	<0.1	0.1	<0.1
Echeneis naucrates	Sharksucker	1	<0.1	<0.1	<0.1
Lutjanus synagris	Lane Snapper	1	<0.1	<0.1	<0.1
Sciaenops ocellatus	Red Drum	1	<0.1	0.6	<0.1
Upeneus parvus	Dwarf Goatfish	1	<0.1	<0.1	<0.1
Chaetodon sedentarius	Reef Butterflyfish	1	<0.1	<0.1	<0.1
Mugil cephalus	Striped Mullet	1	<0.1	0.1	<0.1
Sphyraena spp.	Barracudas	1	<0.1	<0.1	<0.1
Astroscopus spp.	Astroscopus Stargazers	1	<0.1	0.2	<0.1
Astroscopus guttatus	Northern Stargazer	1	<0.1	0.1	<0.1
Astroscopus y-graecum	Southern Stargazer	1	<0.1	0.6	<0.1
Aluterus scriptus	Scrawled Filefish	1	<0.1	<0.1	<0.1
Lagocephalus laevigatus	Smooth Puffer	1	<0.1	<0.1	<0.1
Sphoeroides nephelus	Southern Puffer	1	<0.1	0.1	<0.1
Sharks and Rays					
Rhinoptera bonasus	Cownose Ray	299	<0.1	733.6	2.7
Gymnura micrura	Smooth Butterfly Ray	259	<0.1	390.5	1.4
Dasyatis sabina	Atlantic Stingray	163	<0.1	144.3	0.5
Dasyatis americana	Southern Stingray	138	<0.1	252.3	0.9
Rhizoprionodon terraenovae	Atlantic Sharpnose Shark	9	<0.1	8.2	<0.1
Mustelus canis	Smooth Dogfish	6	<0.1	3.5	<0.1
Myliobatis freminvillei	Bullnose Ray	4	<0.1	3.1	<0.1
Chondrichthyes	Sharks	3	<0.1	1.6	<0.1
Raja eglanteria	Clearnose Skate	3	<0.1	3.6	<0.1

Table 4. Continued...

Species	Common Name	Number		Biomass (kg)	
		Total	%	Total	%
Arthropods and Molluscs					
Callinectes sapidus	Blue Crab	15,046	1.5	623.3	2.3
Farfantepenaeus aztecus	Brown Shrimp	12,804	1.3	174.6	0.6
Lolliguncula brevis	Atlantic Brief Squid	4,172	0.4	52.4	0.2
Litopenaeus setiferus	White Shrimp	3,454	0.3	72.3	0.3
Farfantepenaeus duorarum	Pink Shrimp	2,304	0.2	34.4	0.1
Squilla empusa	Mantis Shrimp	1,780	0.2	30.0	0.1
Crassostrea virginica	Eastern Oyster	1,555	0.2	113.1	0.4
Callinectes similis	Lesser Blue Crab	1,110	0.1	19.1	0.1
Portunus gibbessi	Iridescent Swimming Crab	666	0.1	4.8	<0.1
Anomura paguridea	Hermit Crabs	345	<0.1	7.3	<0.1
Libinia emarginata	Portly Spider Crab	67	<0.1	2.0	<0.1
Polinices duplicatus	Shark Eye	18	<0.1	0.3	<0.1
Limulus polyphemus	Horseshoe Crab	16	<0.1	32.3	0.1
Ovalipes ocellatus	Lady Crab	14	<0.1	0.3	<0.1
Mellita quinquiesperforata	Keyhole Urchin	14	<0.1	0.1	<0.1
Anadara ovalis	Blood Ark	8	<0.1	0.2	<0.1
Busycotypus canaliculatus	Channeled Whelk	6	<0.1	0.2	<0.1
Menippe mercenaria	Florida Stone Crab	6	<0.1	<0.1	0.0
Trachypenaeus constrictus	Roughneck Shrimp	4	<0.1	<0.1	0.0
Decapoda anomura	Anomuran Decapods	4	<0.1	0.1	<0.1
Arenaeus cribarius	Speckled Swimming Crab	4	<0.1	<0.1	0.0
Bivalvia veneroida	Bivalve	3	<0.1	0.3	<0.1
Loligo pealii	Longfin Squid	3	<0.1	0.1	<0.1
Portunus spinimanus	Blotched Swimming Crab	3	<0.1	<0.1	0.0
Goniasteridae	Goniasteridae Sea Stars	3	<0.1	<0.1	0.0
Neogastropoda stenoglossa	Conchs	2	<0.1	0.2	<0.1
Parapenaeus politus	Rose Shrimp	2	<0.1	<0.1	0.0
Xanthidae	Mud Crabs	2	<0.1	<0.1	0.0
Naticidae	Moon Snail-Family	1	<0.1	<0.1	0.0
Busycon carica	Knobbed Whelk	1	<0.1	<0.1	0.0
Geukensia demissa	Ribbed Mussel	1	<0.1	<0.1	0.0
Mercenaria spp.	Quahogs	1	<0.1	0.1	<0.1
Asterias forbesi	Forbes'Asterias Sea Star	1	<0.1	<0.1	0.0

Table 4. Continued...

Species	Common Name	Number Total	Number %	Biomass (kg) Total	Biomass (kg) %
Other Invertebrates					
Cnidaria	Jellyfish			1,746.2	6.4
Stomolophus meleagris	Jelly Bomb			2.4	<0.1
Ascidicea	Tunicates			801.3	2.9
Porifera	Sponges			<0.1	<0.1
Polychaete	Bloodworm			14.5	0.1
Bryozoa, ectoprocta	Bryozoans			15.2	0.1
Other					
Miscellaneous	Miscellaneous			144.4	0.5
Detritus	Detritus			190.1	0.7
Chlorophyta	Unidentified Green Algae			3.2	<0.1
Codium	Algae			2.5	<0.1
Sargassum spp.	Sargassum Weed			0.4	<0.1
Sargassum filipendula	Attatched Gulfweed, Spotd			0.1	<0.1
Agardhiella tenera	Agardh's Red Weed			1.8	<0.1
Gracilaria verrucosa	False Red Weed			11.8	<0.1
Zosteraceae	Sea Grasses			17.6	0.1
Zostrea marina	Eel Grass			10.7	<0.1
Halodule wrightii	Shoal Grass			88.4	0.3
Zoobotryon verticillatum	Bryozoan Animal Grass			0.4	<0.1
Sea Turtles					
Lepidochelys kempi	Kemp's Ridley	1			

Table 5. Weighted CPUE (# of individuals per sample) and standard error (SE) by strata and year for selected species from the Pamlico Sound Survey from 2009 - 2013.

		NR		PR		PUR		PDE		PDW		PSE		PSW	
Common Name	Year	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
Atlantic Croaker	2009	317.1	211.0	405.8	82.4	430.7	96.0	336.3	67.2	197.7	50.8	197.2	102.0	235.2	86.2
	2010	196.0	51.3	805.3	100.0	474.2	194.2	1445.0	290.5	1260.3	366.8	1182.9	203.7	751.8	243.8
	2011	28.3	12.3	340.9	147.5	70.2	30.6	178.4	25.4	151.6	30.0	49.8	30.0	167.6	54.1
	2012	1506.0	494.1	942.1	503.9	902.8	421.1	1301.7	255.7	1219.2	310.5	843.1	337.8	263.0	132.3
	2013	110.9	35.1	1269.4	568.4	563.7	280.9	858.7	136.6	676.7	135.8	1297.9	250.9	151.4	69.9
	Average	431.7		752.7		488.3		824.0		701.1		714.2		313.8	
Atlantic menhaden	2009	2.4	1.0	33.6	22.8	21.5	7.8	11.5	8.0	4.3	1.7	0.4	0.3	2.8	1.6
	2010	23.5	11.5	470.0	188.2	248.0	140.8	14.9	6.5	4.7	2.6	10.3	3.0	17.9	10.5
	2011	1.7	0.6	21.0	8.0	84.7	47.4	6.3	4.2	1.7	0.6	0.5	0.3	2.5	1.4
	2012	21.3	17.4	26.6	16.4	16.8	2.6	0.5	0.2	0.1	0.1	0.1	0.1	7.9	7.9
	2013	0.2	0.2	155.8	149.5	18.2	8.8	1.1	0.4	0.4	0.2	14.6	10.7	0.1	0.1
	Average	9.8		141.4		77.8		6.9		2.3		5.2		6.2	
bluefish	2009	1.0	1.0	1.9	0.8	3.8	2.6	0.1	0.1	0.2	0.1	0.2	0.2	0.3	0.2
	2010	3.9	1.4	16.8	4.7	9.7	2.9	0.8	0.3	2.2	0.7	1.1	0.4	4.5	2.1
	2011	1.2	0.4	1.9	0.7	1.5	0.5	0.4	0.2	0.4	0.2	0.9	0.6	1.1	0.7
	2012	3.9	2.7	2.2	1.0	8.7	4.6	0.4	0.1	1.4	0.9	2.1	0.8	0.3	0.2
	2013	5.6	1.5	9.2	4.8	4.0	1.4	0.5	0.2	0.9	0.3	1.8	0.4	0.2	0.1
	Average	3.1		6.4		5.5		0.4		1.0		1.2		1.3	

Table 5. Continued...

		NR		PR		PUR		PDE		PDW		PSE		PSW	
Common Name	Year	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
	2009	0.2	0.2	0.5	0.4	0.0	0.0	5.8	1.6	3.4	2.6	4.2	2.0	1.5	1.2
	2010	3.2	2.1	0.0	0.0	0.0	0.0	4.6	1.1	12.2	4.7	1.4	0.7	1.7	0.9
butterfish	2011	9.6	6.2	0.0	0.0	0.0	0.0	9.2	2.1	4.1	1.6	0.7	0.4	6.1	4.0
	2012	1.5	1.1	0.2	0.2	0.0	0.0	4.6	1.0	1.4	0.7	1.2	0.7	0.9	0.7
	2013	2.8	1.5	0.0	0.0	0.0	0.0	1.9	0.7	1.1	0.5	0.6	0.6	0.3	0.2
	Average	3.5		0.1		0.0		5.2		4.4		1.6		2.1	
	2009	0.8	0.6	1.0	0.9	0.0	0.0	14.8	6.8	21.4	11.6	62.1	34.2	44.5	20.3
	2010	0.0	0.0	0.0	0.0	0.0	0.0	6.9	3.3	0.4	0.2	2.5	1.2	3.1	2.1
pigfish	2011	0.0	0.0	0.6	0.6	0.0	0.0	30.9	7.5	7.8	3.4	26.4	8.6	28.4	12.1
	2012	0.0	0.0	0.0	0.0	0.0	0.0	19.4	6.2	0.6	0.3	28.3	8.9	5.2	4.3
	2013	0.0	0.0	0.2	0.1	0.0	0.0	13.4	7.7	5.1	2.4	8.6	6.0	1.8	1.1
	Average	0.2		0.4		0.0		17.1		7.1		25.6		16.6	
	2009	0.9	0.5	12.5	2.4	33.3	9.4	0.2	0.1	1.7	1.4	0.9	0.5	0.8	0.4
	2010	4.1	1.4	14.2	2.4	14.2	3.5	1.3	0.5	5.2	2.0	2.1	1.1	3.7	1.6
southern flounder	2011	2.7	1.1	6.4	2.9	15.2	2.4	0.8	0.2	3.7	2.3	0.1	0.1	0.6	0.3
	2012	6.7	3.1	6.7	5.3	1.8	1.5	1.6	0.7	16.1	4.5	3.7	1.7	3.3	2.5
	2013	2.8	1.5	8.3	1.4	18.8	6.4	2.9	0.7	5.2	1.4	2.2	0.5	1.2	0.6
	Average	3.4		9.6		16.7		1.4		6.4		1.8		1.9	
	2009	0.0	0.0	0.2	0.1	0.0	0.0	10.4	2.5	3.2	1.4	3.4	1.4	114.9	104.2
	2010	0.8	0.5	0.4	0.3	0.7	0.7	3.9	0.8	5.3	1.7	6.9	3.6	7.9	2.6
southern kingfish	2011	0.1	0.1			0.3	0.3	11.8	5.0	6.6	2.4	14.8	7.8	9.9	3.9
	2012	2.8	1.0	0.1	0.1	0.8	0.7	13.4	3.0	7.5	2.1	13.4	5.7	5.9	4.1
	2013	9.2	9.2	0.8	0.6	0.0	0.0	11.4	3.6	12.2	4.8	16.4	7.4	10.5	4.5
	Average	2.6		0.4		0.4		10.2		7.0		11.0		29.8	

Table 5. Continued...

		NR		PR		PUR		PDE		PDW		PSE		PSW	
Common Name	Year	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
spot	2009	1805.2	629.7	1647.9	579.8	2566.7	1151.6	170.4	28.2	482.9	123.6	123.0	28.7	574.7	148.5
	2010	519.8	141.8	1463.4	442.7	1663.7	537.2	462.9	77.0	946.2	315.2	597.1	173.9	415.9	139.9
	2011	400.4	131.1	589.1	167.9	860.7	239.6	435.5	62.5	364.4	91.0	254.3	111.8	561.8	128.9
	2012	1287.0	438.9	847.6	478.5	2757.0	1210.5	698.3	130.9	1147.8	188.0	851.5	247.5	849.9	270.6
	2013	1471.4	459.6	1719.6	447.3	3265.2	1227.4	603.7	158.7	1621.4	474.2	891.6	175.7	272.1	154.2
	Average	1096.8		1253.5		2222.6		474.2		912.5		543.5		534.9	
summer flounder	2009	2.6	1.2	2.1	1.0	1.2	0.7	6.2	1.4	4.0	1.6	11.9	3.3	11.0	3.0
	2010	0.3	0.2	1.5	1.4	0.3	0.3	15.8	4.5	4.6	1.7	18.9	6.8	7.7	2.3
	2011	4.9	3.0	0.3	0.2	2.3	2.1	9.6	1.8	4.2	1.5	9.1	2.4	8.4	1.8
	2012	0.8	0.7	0.0	0.0	0.0	0.0	12.9	3.1	3.8	1.2	6.9	1.8	10.1	2.2
	2013	2.9	1.4	6.9	5.7	4.7	4.3	13.5	2.6	13.9	2.9	15.1	2.9	15.4	4.4
	Average	2.3		2.2		1.7		11.6		6.1		12.4		10.5	
weakfish	2009	1.7	1.2	42.6	26.4	10.5	4.4	71.4	17.7	11.3	3.2	7.9	5.2	5.9	3.9
	2010	2.6	2.2	3.5	2.1	8.2	8.2	94.5	16.5	63.7	36.3	73.8	22.0	34.2	27.7
	2011	0.6	0.5	5.6	3.8	8.8	3.1	80.4	19.2	5.2	2.2	14.9	12.1	8.4	3.2
	2012	2.9	1.4	5.3	4.8	1.5	1.1	58.5	13.4	30.4	18.5	27.5	12.8	3.8	3.5
	2013	0.4	0.2	12.6	6.4	11.7	6.5	70.4	16.1	17.7	7.7	68.8	32.2	2.0	0.8
	Average	1.6		13.9		8.1		75.0		25.6		38.6		10.9	
blue crab	2009	0.5	0.3	32.4	13.8	37.0	24.4	3.3	1.0	10.3	5.2	3.7	1.3	3.1	1.3
	2010	40.6	19.0	172.3	57.1	86.3	37.8	31.4	11.2	100.3	44.1	53.2	14.0	38.0	16.3
	2011	8.1	4.0	107.7	39.6	101.7	41.3	5.6	1.2	18.4	15.1	14.9	8.7	2.6	0.9
	2012	18.6	9.4	44.9	26.2	48.7	22.5	10.6	2.7	20.9	7.1	19.1	11.6	13.1	6.7
	2013	6.5	2.7	10.9	7.0	16.2	7.7	36.0	9.2	7.4	2.5	50.0	23.8	3.3	1.2
	Average	14.9		73.6		58.0		17.4		31.5		28.2		12.0	

Table 5. Continued...

		NR		PR		PUR		PDE		PDW		PSE		PSW	
Common Name	Year	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE	CPUE	SE
brown shrimp	2009	4.2	2.3	17.5	6.4	15.0	9.1	12.8	4.1	13.4	4.6	2.1	1.0	12.1	6.4
	2010	7.0	5.0	4.9	2.0	15.3	7.2	18.7	5.8	61.1	21.8	62.3	34.1	76.3	62.6
	2011	51.2	33.6	62.3	30.7	90.2	56.9	28.2	9.7	88.6	67.9	5.9	3.3	46.7	28.0
	2012	46.0	22.0	9.1	8.8	2.3	1.0	8.3	1.7	30.0	11.7	13.5	9.3	30.2	23.7
	2013	2.9	2.5	5.2	2.6	2.3	1.8	14.1	2.6	10.0	2.1	12.7	4.7	1.2	0.5
	Average	22.3		19.8		25.0		16.4		40.6		19.3		33.3	
pink shrimp	2009	2.0	1.2	0.1	0.1	0.0	0.0	11.4	2.8	4.7	1.2	2.2	1.1	6.7	3.6
	2010	0.1	0.1	0.1	0.1	0.0	0.0	2.0	0.5	1.1	0.5	0.6	0.3	0.0	0.0
	2011	0.1	0.1	0.0	0.0	0.0	0.0	1.5	0.6	1.4	0.9	0.6	0.4	0.4	0.3
	2012	10.9	6.2	0.0	0.0	0.0	0.0	4.3	0.8	6.5	2.3	1.7	0.7	1.5	0.9
	2013	9.8	4.5	0.0	0.0	0.0	0.0	17.6	4.2	7.8	2.6	1.8	1.6	3.8	3.3
	Average	4.6		0.0		0.0		7.3		4.3		1.4		2.5	
white shrimp	2009	3.9	2.2	20.7	13.9	3.3	2.0	5.7	2.2	9.3	3.8	0.8	0.6	8.7	7.1
	2010	3.7	2.0	4.9	2.5	1.5	0.8	3.1	1.2	3.9	2.0	19.5	11.5	2.3	1.6
	2011	0.2	0.2	0.1	0.1	0.2	0.2	0.9	0.8	0.8	0.3	1.4	1.0	0.3	0.2
	2012	1.5	0.7	1.4	1.4	0.5	0.5	12.0	3.9	3.3	1.2	5.6	4.5	0.6	0.4
	2013	0.9	0.5	5.3	3.0	16.3	7.5	13.1	3.9	9.4	3.6	35.1	18.0	3.3	2.2
	Average	2.0		6.5		4.4		7.0		5.3		12.5		3.0	

Table 6. Weighted CPUE, standard error (SE), total number collected (n), mean size (mm), and size range for select species from 2009 - 2013 in the Pamlico Sound Survey.

Common Name	Year	CPUE	SE	n	Mean Size (mm)	SE	Min (mm)	Max (mm)
Atlantic croaker	2009	277.6	37.1	31,937	143.3	0.5	68	243
	2010	1,170.2	148.2	117,422	122.1	0.5	60	338
	2011	148.1	15.7	16,350	144.0	0.7	52	237
	2012	1,105.1	140.7	118,344	123.4	0.5	51	247
	2013	778.8	78.1	83,396	119.4	0.4	51	259
	All	696.0	48.7	367,449	124.7	0.2	51	338
Atlantic menhaden	2009	7.9	3.4	1,064	133.9	1.4	87	209
	2010	37.7	10.7	7,798	95.4	1.1	13	217
	2011	5.8	1.9	1,167	131.5	0.8	38	202
	2012	4.0	1.6	705	91.0	1.6	62	208
	2013	10.7	7.2	1,984	76.7	2.0	16	250
	All	13.2	2.9	12,718	98.8	0.7	13	250
bluefish	2009	0.3	0.1	64	199.8	5.8	116	283
	2010	2.6	0.4	397	174.1	1.8	99	294
	2011	0.7	0.2	86	182.8	4.7	72	286
	2012	1.3	0.3	188	174.2	3.4	77	311
	2013	1.6	0.3	236	168.5	3.8	69	288
	All	1.3	0.1	971	175.2	1.5	69	311
butterfish	2009	3.9	0.9	375	126.9	1.5	42	180
	2010	5.2	1.2	470	93.6	1.3	27	187
	2011	6.0	1.1	608	116.0	1.6	46	186
	2012	2.5	0.4	252	127.0	1.5	66	177
	2013	1.3	0.3	133	112.1	2.5	52	192
	All	3.8	0.4	1,838	113.7	0.8	27	192
pigfish	2009	24.5	6.7	2,310	134.2	0.6	87	194
	2010	3.5	1.4	347	137.1	1.2	64	188
	2011	20.9	3.6	2,033	132.5	0.7	53	298
	2012	12.6	2.9	1,234	133.7	0.7	77	183
	2013	8.0	3.3	769	125.7	1.1	64	208
	All	13.9	1.8	6,693	132.8	0.4	53	298

Table 6. Continued...

Common Name	Year	CPUE	SE	n	Mean Size (mm)	SE	Min (mm)	Max (mm)
	2009	1.8	0.4	393	164.2	3.6	67	467
	2010	3.5	0.6	482	162.4	2.8	59	365
southern flounder	2011	1.9	0.6	286	162.4	4.0	78	461
	2012	5.9	1.2	583	157.0	2.5	41	397
	2013	3.6	0.5	477	153.2	3.0	55	377
	All	3.3	0.3	2,221	159.3	1.4	41	467
	2009	16.6	10.2	1,672	170.4	1.5	57	315
	2010	4.6	0.8	443	202.1	2.5	65	308
southern kingfish	2011	9.4	2.4	900	157.1	1.3	65	290
	2012	9.9	1.6	953	193.1	1.5	44	383
	2013	11.5	2.2	1,112	159.2	1.9	88	325
	All	10.4	2.2	5,080	172.6	0.8	44	383
	2009	483.0	62.3	72,908	105.1	0.4	43	232
	2010	653.2	86.2	77,882	94.7	0.4	43	210
spot	2011	415.1	40.4	48,218	116.3	0.4	58	231
	2012	910.8	90.7	106,901	101.0	0.3	52	382
	2013	988.7	134.4	120,037	98.2	0.3	16	210
	All	690.2	41.4	425,946	101.5	0.2	16	382
	2009	6.5	0.9	650	177.7	2.2	82	490
	2010	11.0	2.1	1,076	139.1	1.7	46	380
summer flounder	2011	7.3	0.9	734	160.3	1.9	70	421
	2012	8.1	1.3	787	160.6	2.0	86	414
	2013	12.9	1.4	1,280	148.6	1.5	70	353
	All	9.2	0.6	4,527	154.5	0.8	46	490
	2009	35.2	7.3	3,735	155.4	1.0	58	348
	2010	67.1	11.4	6,413	181.6	0.7	54	378
weakfish	2011	36.9	7.9	3,716	174.0	1.2	52	290
	2012	35.2	7.1	3,401	175.5	1.2	36	317
	2013	43.4	8.3	4,316	165.8	1.0	16	343
	All	43.5	3.8	21,581	171.6	0.5	16	378

Table 6. Continued...

Common Name	Year	CPUE	SE	n	Mean Size (mm)	SE	Min (mm)	Max (mm)
blue crab	2009	6.5	1.5	951	71.5	1.4	15	200
	2010	58.7	11.6	6,831	74.9	0.4	23	191
	2011	15.7	4.2	2,557	100.2	0.8	15	196
	2012	16.9	3.0	2,110	87.1	0.9	19	190
	2013	25.0	5.2	2,579	66.4	0.7	19	183
	All	24.6	2.9	15,028	79.2	0.3	15	200
brown shrimp	2009	10.9	2.1	1,211	117.5	0.9	63	196
	2010	38.9	9.6	3,693	94.7	0.5	54	190
	2011	44.2	16.3	4,946	118.8	0.5	53	195
	2012	18.6	4.1	1,927	118.9	0.6	41	185
	2013	10.4	1.4	1,027	116.6	0.8	47	192
	All	24.6	3.9	12,804	111.6	0.3	41	196
pink shrimp	2009	6.8	1.2	660	108.7	0.8	68	179
	2010	1.1	0.2	109	101.0	1.4	74	138
	2011	1.0	0.3	96	106.6	1.7	72	185
	2012	4.3	0.8	436	123.0	1.1	64	182
	2013	10.1	1.8	1,003	110.2	0.7	65	181
	All	4.7	0.5	2,304	111.6	0.4	64	185
white shrimp	2009	6.6	1.6	760	133.9	0.9	63	196
	2010	5.8	1.9	586	135.7	0.8	43	198
	2011	0.8	0.4	77	151.3	1.7	116	177
	2012	6.6	1.7	655	144.8	0.9	80	198
	2013	13.4	3.2	1,376	128.3	0.7	16	196
	All	6.6	0.9	3,454	134.4	0.4	16	198

Table 7. Pamlico Sound Survey and NCDMF P120 CPUE's for select species, 1987 - 2013.

	brown shrimp						blue crab					
Year	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All
1987	0.0	1.6	0.4	1.0	14.3	7.5	92.0	6.8	25.0	3.0	7.1	5.0
1988	0.4	8.7	2.4	4.7	36.6	20.9	28.1	9.6	10.3	4.8	5.7	5.3
1989	1.0	4.7	1.2	4.3	41.3	22.8	42.0	7.2	17.7	1.2	2.7	2.0
1990	2.2	4.2	2.2	47.3	47.5	47.4	188.8	14.0	70.7	4.6	4.0	4.3
1991	30.6	3.1	17.0	54.9	67.9	61.4	159.0	10.0	83.8	3.7	4.1	3.9
1992	0.0	7.7	3.8	3.2	35.8	19.4	68.9	7.8	38.1	2.5	2.1	2.3
1993	0.1	9.5	4.8	0.2	20.7	10.5	72.6	11.2	42.0	2.0	2.5	2.2
1994	0.0	12.2	5.8	20.4	40.1	30.3	43.4	11.2	28.0	3.4	5.3	4.4
1995	0.3	11.2	5.7	33.2	37.4	35.3	36.2	4.3	20.4	3.8	4.3	4.1
1996	0.5	19.4	10.0	22.7	34.5	28.6	50.3	18.6	34.0	6.6	13.3	10.0
1997	0.3	22.7	11.8	2.3	28.8	15.4	108.8	9.5	55.6	5.7	5.9	5.8
1998	0.1	7.5	4.0	2.4	11.7	7.0	29.8	13.7	21.6	1.7	3.7	2.7
1999	85.9	10.1	48.5	8.9	98.9	53.9	72.5	8.4	40.9	3.1	7.6	5.4
2000	6.1	21.6	13.7	60.6	65.7	63.1	40.5	5.4	23.0	1.2	2.9	2.1
2001	3.7	8.2	6.0	21.9	51.6	36.9	43.0	2.2	22.7	2.7	4.4	3.5
2002	49.5	6.3	28.2	83.2	54.4	68.8	81.6	1.8	41.8	5.4	6.0	5.7
2003	14.4	14.5	13.9	19.6	36.9	28.1	81.2	3.2	41.8	2.2	3.6	2.9
2004	9.2	14.6	11.9	8.8	40.4	24.6	74.0	3.1	39.0	4.8	9.5	7.2
2005	1.5	32.5	17.1	1.6	35.8	18.7	38.2	3.7	21.0	1.4	3.5	2.5
2006	13.4	5.7	9.5	18.4	35.2	26.8	31.0	1.4	16.2	2.2	5.9	4.0
2007	3.8	26.4	15.3	15.9	28.6	22.3	20.5	1.6	10.6	1.1	2.1	1.6
2008	28.7	18.7	23.7	91.2	120.0	105.6	32.7	1.1	16.9	3.0	4.6	3.8
2009	6.6	15.3	10.9	59.4	71.7	65.6	8.1	1.5	4.8	2.2	2.0	2.1
2010	75.1	2.7	38.9	65.8	62.3	64.0	92.7	3.2	47.9	2.9	6.2	4.5
2011	80.0	8.5	44.2	46.2	49.9	48.0	17.3	1.2	9.3	3.9	8.1	6.0
2012	29.6	7.6	18.6	54.0	36.9	45.4	18.3	1.2	9.7	7.9	4.1	6.0
2013	8.0	12.8	10.4	14.4	31.3	22.8	41.6	1.3	21.5	0.7	1.7	1.2

Table 7. Continued...

	Atlantic menhaden						weakfish					
Year	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All
1987	1.1	0.1	0.3	7.0	3.7	5.4	0.2	12.0	2.8	0.0	0.0	0.0
1988	7.4	0.9	2.1	47.5	5.1	26.0	0.0	100.2	27.4	0.0	0.9	0.4
1989	11.6	5.6	4.1	63.1	11.6	37.4	0.5	14.0	3.1	0.0	0.2	0.1
1990	25.7	25.9	17.2	32.8	8.3	20.4	0.2	49.6	17.5	0.0	0.1	0.0
1991	7.3	53.0	31.2	57.4	12.4	35.1	1.1	36.5	18.5	0.0	0.1	0.0
1992	0.4	0.1	0.3	7.0	7.0	7.0	0.5	42.3	21.5	0.0	0.0	0.0
1993	0.6	1.4	1.0	20.3	13.5	16.9	0.8	9.6	5.2	0.0	0.0	0.0
1994	0.2	0.2	0.2	10.0	3.8	6.9	0.4	71.2	34.7	0.0	0.3	0.1
1995	0.3	2.1	1.2	22.2	2.2	12.2	0.5	38.3	18.8	0.0	0.7	0.4
1996	2.0	25.7	13.9	55.3	3.5	29.2	0.1	71.4	36.5	0.0	1.5	0.8
1997	0.2	0.6	0.4	7.4	7.0	7.2	0.6	34.1	17.4	0.0	0.2	0.1
1998	11.7	41.5	26.3	61.2	29.3	45.2	0.0	69.9	34.4	0.0	0.0	0.0
1999	0.4	142.0	65.7	22.6	18.7	20.6	155.9	99.4	128.4	0.0	1.6	0.8
2000	8.1	6.7	7.5	8.9	7.4	8.1	0.8	62.7	31.9	0.0	5.6	2.9
2001	2.6	0.4	1.5	23.3	4.9	14.0	0.3	29.9	15.1	0.0	0.7	0.3
2002	1.2	0.6	0.9	12.4	3.1	7.7	0.7	21.8	11.2	0.0	0.5	0.2
2003	2.4	14.3	8.4	10.6	4.8	7.8	0.5	24.6	12.5	0.0	0.1	0.0
2004	9.9	30.4	20.1	26.3	10.5	18.4	0.4	29.1	14.7	0.0	1.4	0.7
2005	0.2	4.0	1.7	26.0	33.1	29.5	0.1	28.7	14.2	0.0	0.0	0.0
2006	0.1	0.6	0.3	2.2	4.1	3.1	0.8	42.0	21.4	0.0	0.1	0.0
2007	0.1	2.1	1.1	30.7	2.4	16.6	0.1	56.5	29.1	0.0	0.1	0.0
2008	66.6	20.2	43.4	13.2	7.3	10.2	0.0	51.4	25.7	0.0	17.0	8.5
2009	0.1	5.3	2.7	15.0	1.0	8.0	0.0	58.3	29.2	0.0	0.2	0.1
2010	32.6	21.7	27.1	35.7	5.6	20.6	0.8	32.2	16.5	0.0	0.0	0.0
2011	0.7	2.1	1.4	22.8	6.4	14.6	0.3	33.4	16.9	0.0	0.2	0.1
2012	5.2	2.2	3.7	1.9	0.5	1.2	0.6	40.2	20.4	0.0	0.8	0.4
2013	14.1	0.8	7.5	20.9	9.3	15.1	0.1	59.1	29.6	0.0	0.1	0.0

Table 7. Continued...

	spot						Atlantic croaker					
Year	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All
1987	61.7	26.0	21.3	408.7	97.0	256.6	104.4	94.5	48.0	17.6	23.5	20.5
1988	445.2	192.2	161.0	341.3	117.6	227.6	74.1	249.4	84.1	25.2	26.0	25.6
1989	212.7	176.1	89.2	233.2	139.9	186.5	117.8	196.4	73.5	12.5	21.1	16.8
1990	771.4	242.7	350.2	255.8	160.1	207.6	360.9	265.2	202.4	19.8	20.2	20.0
1991	287.7	122.5	206.2	105.0	68.7	87.0	272.5	114.3	194.4	6.1	7.5	6.8
1992	75.8	271.1	171.0	209.3	101.8	155.6	70.2	450.7	256.9	18.1	14.5	16.3
1993	457.4	186.6	330.6	562.6	209.6	386.1	449.5	707.5	579.3	47.9	50.2	49.1
1994	85.6	216.2	149.6	229.9	93.7	161.2	180.1	524.4	341.1	22.4	30.2	26.3
1995	43.3	135.2	89.5	208.2	78.7	143.4	174.2	321.8	247.6	44.7	26.7	35.7
1996	334.5	463.7	400.7	375.9	127.5	250.7	67.4	375.9	225.1	14.9	14.8	14.9
1997	159.6	88.0	117.5	218.3	59.4	139.5	418.3	398.3	387.6	98.5	41.6	70.2
1998	123.0	73.4	96.4	75.7	28.1	51.9	735.9	1006.1	834.1	147.2	86.9	117.0
1999	448.3	404.2	422.3	258.0	88.7	173.4	775.9	543.7	664.2	37.0	22.2	29.6
2000	112.6	140.9	126.6	128.2	68.6	98.2	171.9	430.5	294.3	99.3	64.5	81.8
2001	203.1	231.7	219.8	358.0	177.0	266.8	113.9	244.3	179.3	27.6	16.4	22.0
2002	334.0	274.9	304.5	282.0	144.6	213.3	81.8	194.9	138.9	30.6	20.2	25.4
2003	545.1	399.3	469.1	222.2	71.2	147.9	170.2	143.3	156.1	39.8	17.3	28.7
2004	410.6	384.1	396.7	319.2	126.6	222.9	455.0	577.7	515.8	70.8	48.1	59.4
2005	203.1	525.9	351.7	337.1	93.1	215.1	225.7	712.9	467.5	79.0	47.3	63.2
2006	85.8	225.9	155.8	132.7	70.2	101.5	131.5	420.6	276.1	10.7	7.0	8.9
2007	161.4	382.9	271.5	244.3	102.1	173.2	113.4	449.1	282.3	64.0	39.4	51.7
2008	1270.2	666.9	968.5	357.9	177.9	267.9	312.4	632.6	472.5	14.8	18.1	16.4
2009	191.3	598.1	394.7	254.5	140.0	197.2	82.7	399.0	240.9	14.8	11.9	13.4
2010	721.7	441.8	581.8	436.0	198.6	317.3	1175.4	850.2	1012.8	97.5	43.8	70.7
2011	377.7	122.7	250.2	49.7	22.1	35.9	90.5	118.6	104.5	5.5	3.8	4.6
2012	945.4	544.1	744.7	176.0	79.9	127.9	1149.2	889.0	1019.1	18.0	10.0	14.0
2013	1100.8	548.6	824.7	228.1	79.2	153.7	571.0	928.6	749.8	35.4	35.4	35.4

Table 7. Continued...

	summer flounder						southern flounder					
Year	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All	PSS June	PSS Sept	PSS All	P120 May	P120 June	P120 All
1987	19.6	7.6	6.8	0.0	0.2	0.1	4.8	1.0	1.3	3.4	2.0	2.7
1988	2.3	3.6	1.6	0.3	0.2	0.3	2.8	1.3	1.1	3.9	2.3	3.1
1989	6.8	3.6	2.6	0.2	0.0	0.1	1.0	0.5	0.4	4.4	2.3	3.3
1990	4.2	11.9	5.2	0.2	0.2	0.2	5.6	1.1	2.2	7.4	6.3	6.9
1991	5.8	2.8	4.2	0.1	0.2	0.1	4.5	0.6	2.6	2.0	1.1	1.6
1992	9.0	9.4	9.1	0.3	0.0	0.2	4.3	4.8	4.6	2.8	2.7	2.8
1993	5.1	7.1	6.1	0.1	0.0	0.0	3.2	3.8	3.6	5.2	2.7	4.0
1994	8.1	11.2	9.8	0.3	0.0	0.1	7.2	3.3	5.3	1.8	2.5	2.2
1995	6.6	6.5	6.5	0.0	0.0	0.0	1.9	2.8	2.4	2.3	1.7	2.0
1996	30.3	16.0	23.2	0.2	0.1	0.1	7.1	9.7	8.4	11.4	9.5	10.4
1997	14.0	11.4	12.5	0.1	0.0	0.0	9.9	3.1	6.5	4.2	2.8	3.5
1998	10.3	9.8	9.5	0.1	0.0	0.1	1.2	0.4	0.7	1.0	0.9	0.9
1999	3.2	4.0	3.6	0.1	0.0	0.0	4.6	1.9	3.4	3.6	2.3	3.0
2000	3.8	2.0	2.9	0.0	0.1	0.0	5.4	0.8	3.1	5.6	3.5	4.5
2001	21.8	14.0	18.2	0.1	0.0	0.1	1.8	0.8	1.3	5.1	4.9	5.0
2002	18.0	6.0	12.3	0.1	0.0	0.1	1.4	3.3	2.2	6.0	6.0	6.0
2003	7.1	5.9	6.3	0.0	0.0	0.0	1.5	2.9	2.2	8.6	5.4	7.0
2004	5.8	7.4	6.5	0.2	0.0	0.1	1.7	1.3	1.5	6.3	3.7	5.0
2005	9.7	6.7	8.1	0.0	0.0	0.0	2.3	3.3	2.6	5.4	2.6	4.0
2006	1.9	4.3	3.1	0.0	0.0	0.0	1.4	1.0	1.2	3.8	2.7	3.3
2007	3.6	4.1	3.8	0.0	0.0	0.0	0.5	1.1	0.8	4.7	4.4	4.6
2008	14.2	16.6	15.4	0.0	0.1	0.0	1.2	0.9	1.0	3.2	3.2	3.2
2009	4.5	6.3	5.4	0.1	0.0	0.1	0.9	1.3	1.1	3.2	2.0	2.6
2010	14.1	6.0	10.0	0.0	0.0	0.0	3.2	1.1	2.2	8.4	4.3	6.4
2011	6.6	7.1	6.8	0.0	0.0	0.0	1.9	0.6	1.3	1.3	1.0	1.2
2012	9.1	5.3	7.2	0.0	0.1	0.1	4.4	4.4	4.4	4.6	2.7	3.6
2013	9.7	14.4	12.1	0.1	0.2	0.1	3.4	1.0	2.2	4.3	2.4	3.4

Table 8. Pearson correlation coefficients for select species between the Pamlico Sound Survey and Estuarine Trawl Survey (NCDMF Program 120), 1987 - 2013.

		Estuarine Trawl Survey					
		May		June		Annual	
Species	Pamlico Sound Survey	PCC	p	PCC	p	PCC	p
Atlantic Croaker	June	0.41	0.03*	0.53	0.00*	0.49	0.01*
	September	0.31	0.11	0.57	0.00*	0.44	0.02*
	Annual	0.38	0.05*	0.55	0.00*	0.48	0.01*
Atlantic menhaden	June	0.12	0.56	0.28	0.16	0.27	0.17
	September	0.03	0.90	0.40	0.04*	0.36	0.07
	Annual	0.10	0.61	0.37	0.06	0.35	0.08
blue crab	June	0.21	0.28	0.23	0.25	0.22	0.28
	September	0.09	0.66	0.30	0.13	0.12	0.54
	Annual	0.15	0.45	0.30	0.12	0.18	0.38
brown shrimp	June	0.45	0.02*	-0.10	0.60	0.44	0.02*
	September	0.55	0.00*	0.05	0.82	0.58	0.00*
	Annual	0.55	0.00*	-0.04	0.85	0.56	0.00*
Southern flounder	June	0.15	0.44	0.49	0.01*	0.34	0.08
	September	0.18	0.36	0.56	0.00*	0.40	0.04*
	Annual	0.17	0.39	0.53	0.00*	0.38	0.05*
summer flounder	June	-0.01	0.98	0.21	0.29	0.07	0.72
	September	0.06	0.77	0.13	0.52	-0.05	0.82
	Annual	0.03	0.90	0.11	0.57	-0.03	0.89
spot	June	0.21	0.29	0.26	0.20	0.23	0.25
	September	0.32	0.10	0.33	0.10	0.31	0.11
	Annual	0.25	0.20	0.29	0.15	0.26	0.18
weakfish	June						
	September	0.02	0.91	0.16	0.43	0.11	0.59
	Annual	0.02	0.91	0.16	0.43	0.11	0.58

* Indicates significant correlation at $p < 0.05$.

Table 9. Protected species interactions for the Pamlico Sound Survey, 1987 - 2013.

Year	Month	Species	Condition	Depth (m)	Strata	Latitude	Longitude
1987	September	Loggerhead turtle	Alive	4.6	PDE	35˚22'00"	75˚55'30"
1989	June	Loggerhead turtle	Alive	3.4	PSE	35˚14'30"	75˚46'00"
1992	September	Loggerhead turtle	Alive	6.1	PDE	35˚27'00"	75˚45'30"
1996	September	Loggerhead turtle	Alive	4.6	PDE	35˚32'00"	75˚33'30"
1996	September	Loggerhead turtle	Alive	4.0	PDE	35˚33'00"	75˚43'00"
2000	June	Kemp's ridley turtle	Alive	3.7	PSE	35˚24'00"	75˚34'00"
2000	September	Loggerhead turtle	Alive	6.1	PDW	35˚07'00"	75˚17'00"
2001	June	Loggerhead turtle	Alive	5.8	PDW	35˚07'00"	75˚21'00"
2002	June	Loggerhead turtle	Alive	6.4	PDE	35˚17'00"	75˚55'00"
2002	June	Green turtle	Alive	5.2	PDE	35˚21'00"	75˚59'00"
2005	June	Atlatntic sturgeon	Alive	2.7	NR	35˚00'00"	75˚56'00"
2011	June	Kemp's ridley turtle	Alive	3.3	PSE	35˚52'00"	75˚42'00"

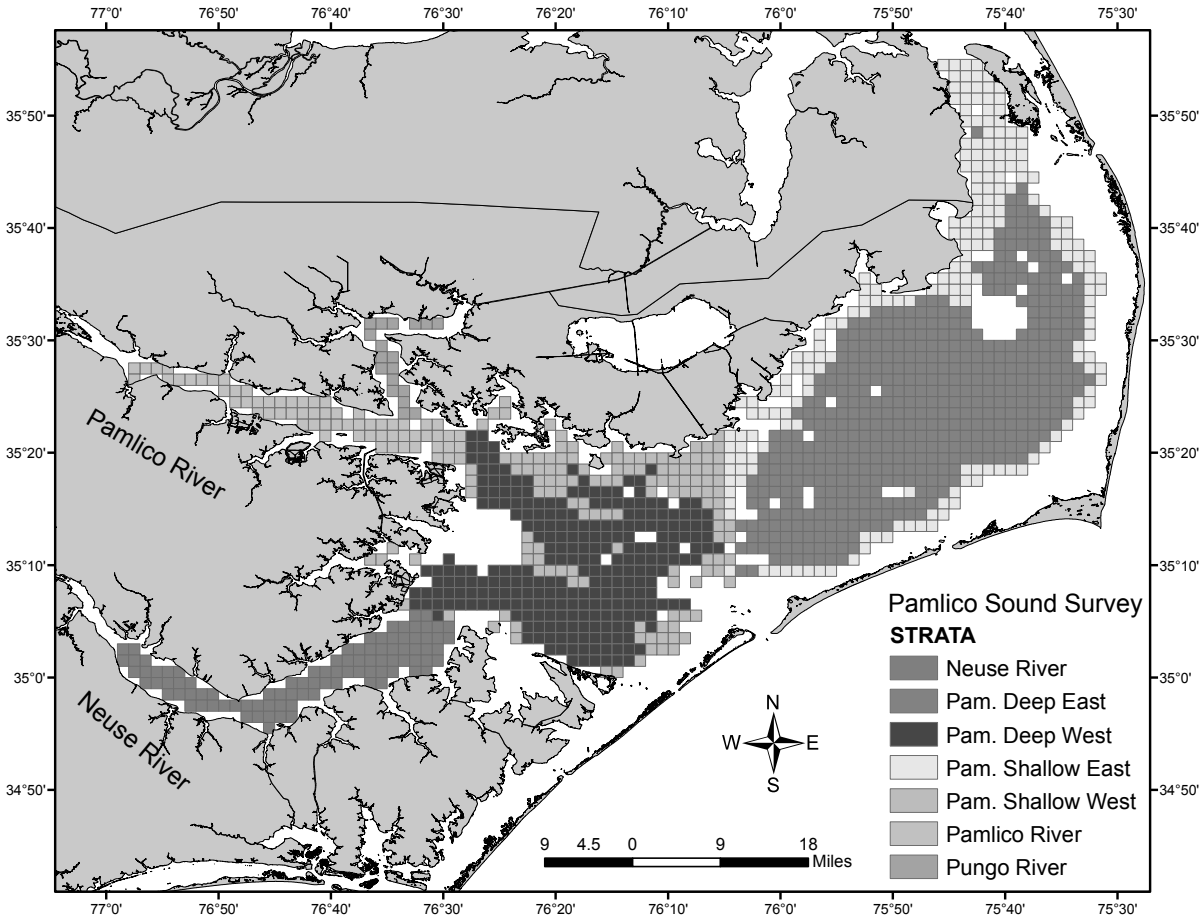

Figure 1. Pamlico Sound Survey sampling grids by strata.

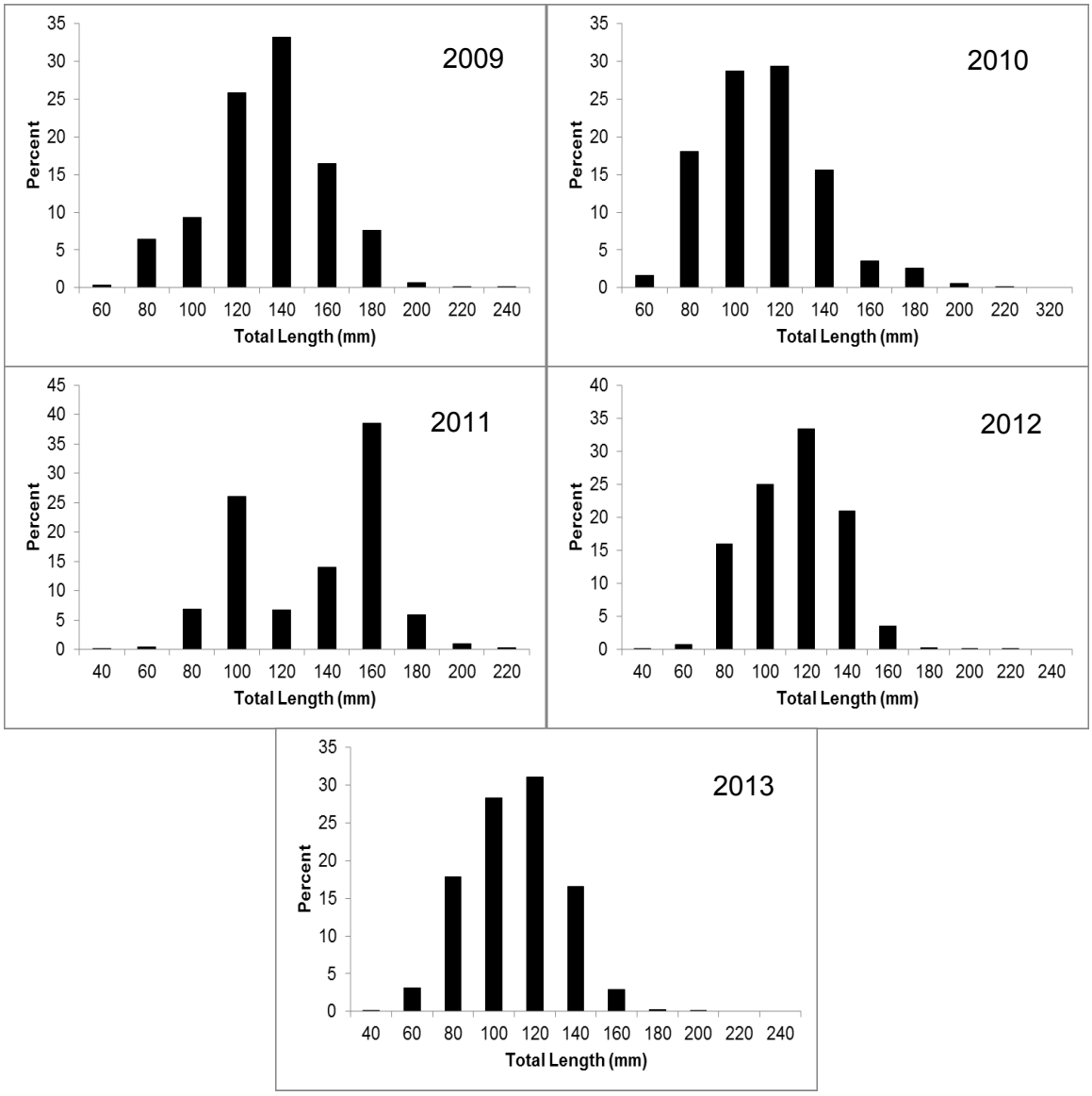

Figure 2. Expanded length frequency of Atlantic croaker for the 2009 - 2013 Pamlico Sound Surveys (N = 367,449).

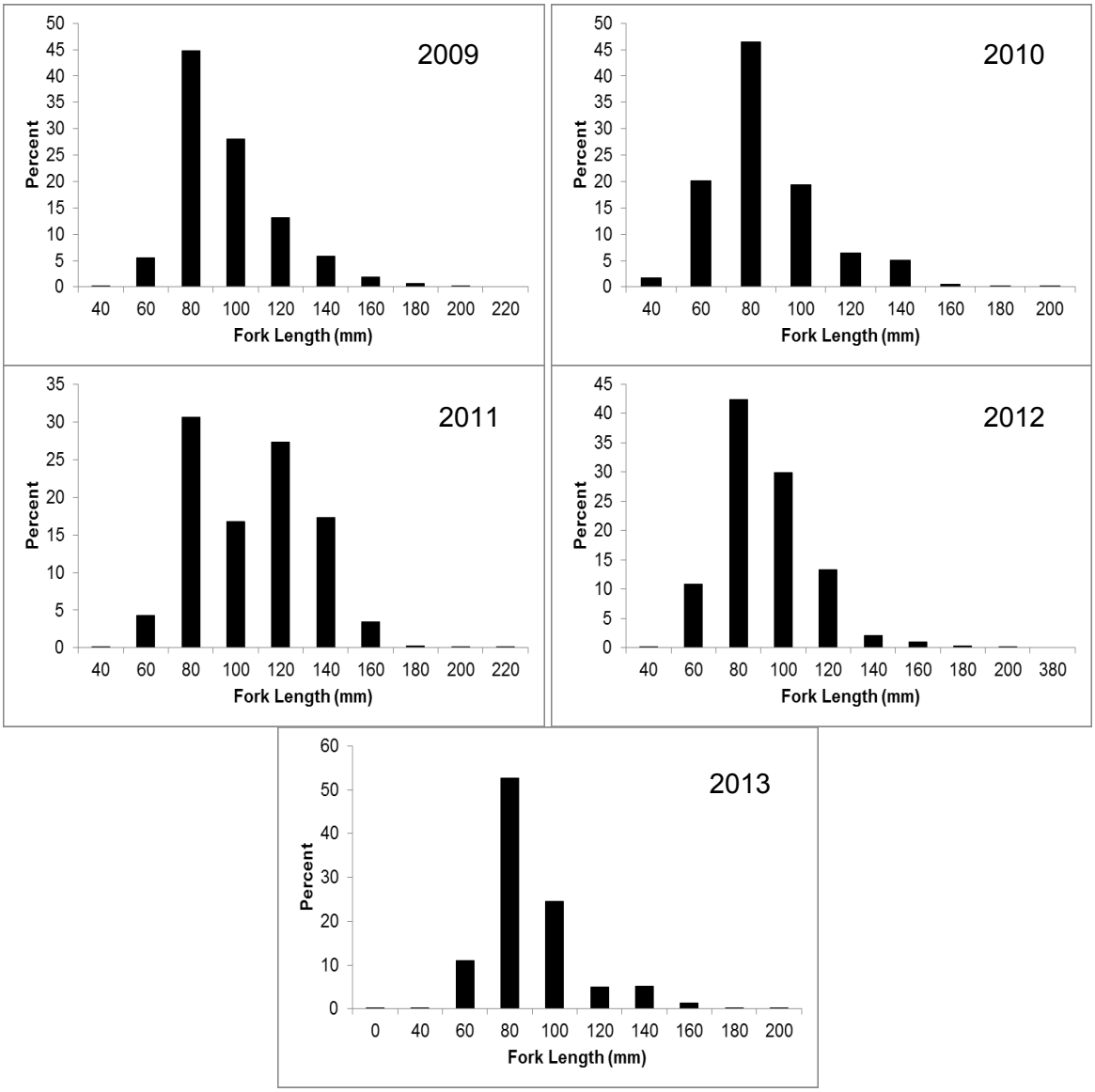

Figure 3. Expanded length frequency of spot for the 2009 - 2013 Pamlico Sound Surveys (N = 425,947).

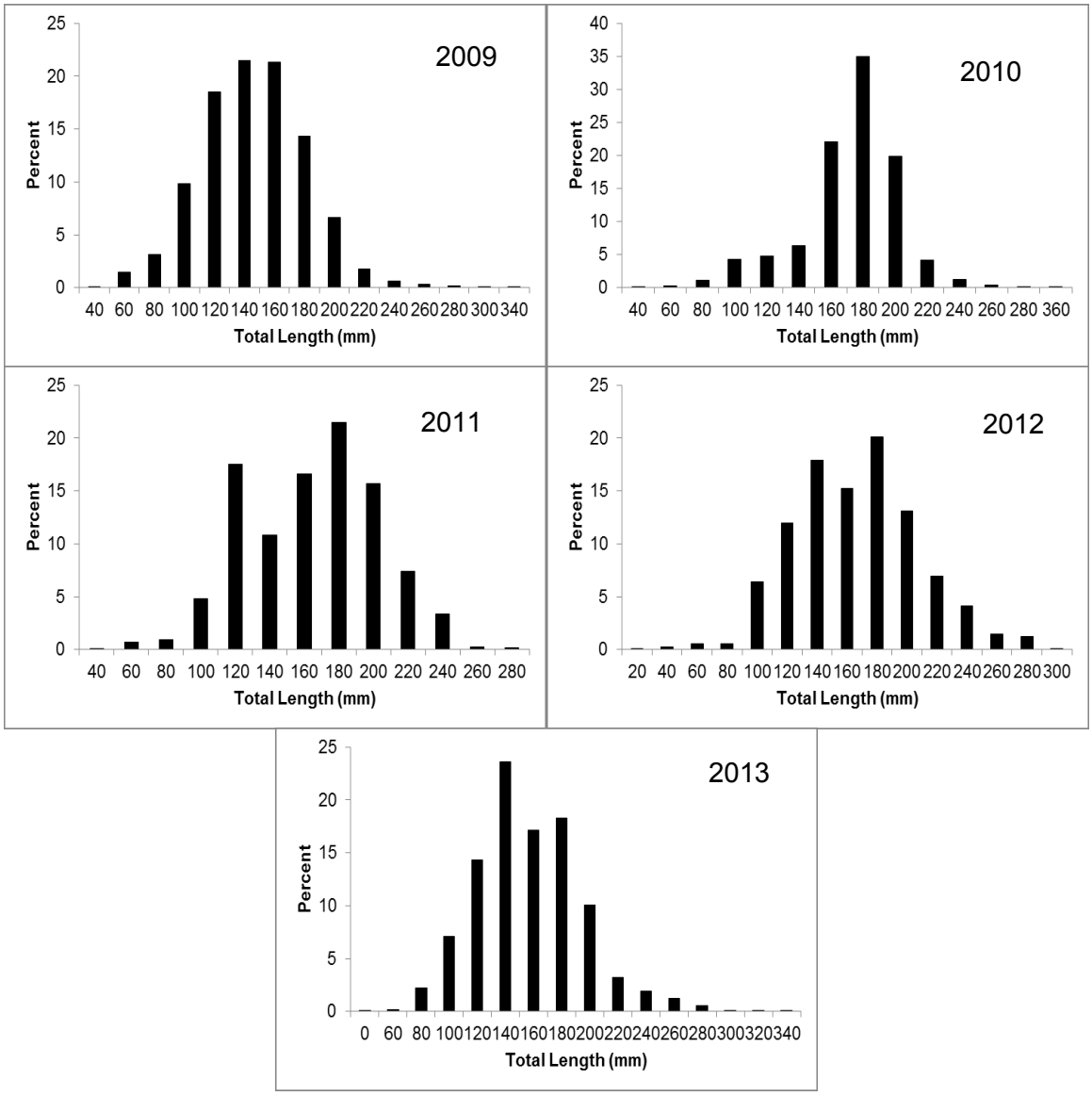

Figure 4. Expanded length frequency of weakfish for the 2009 - 2013 Pamlico Sound Surveys (N = 21,581).

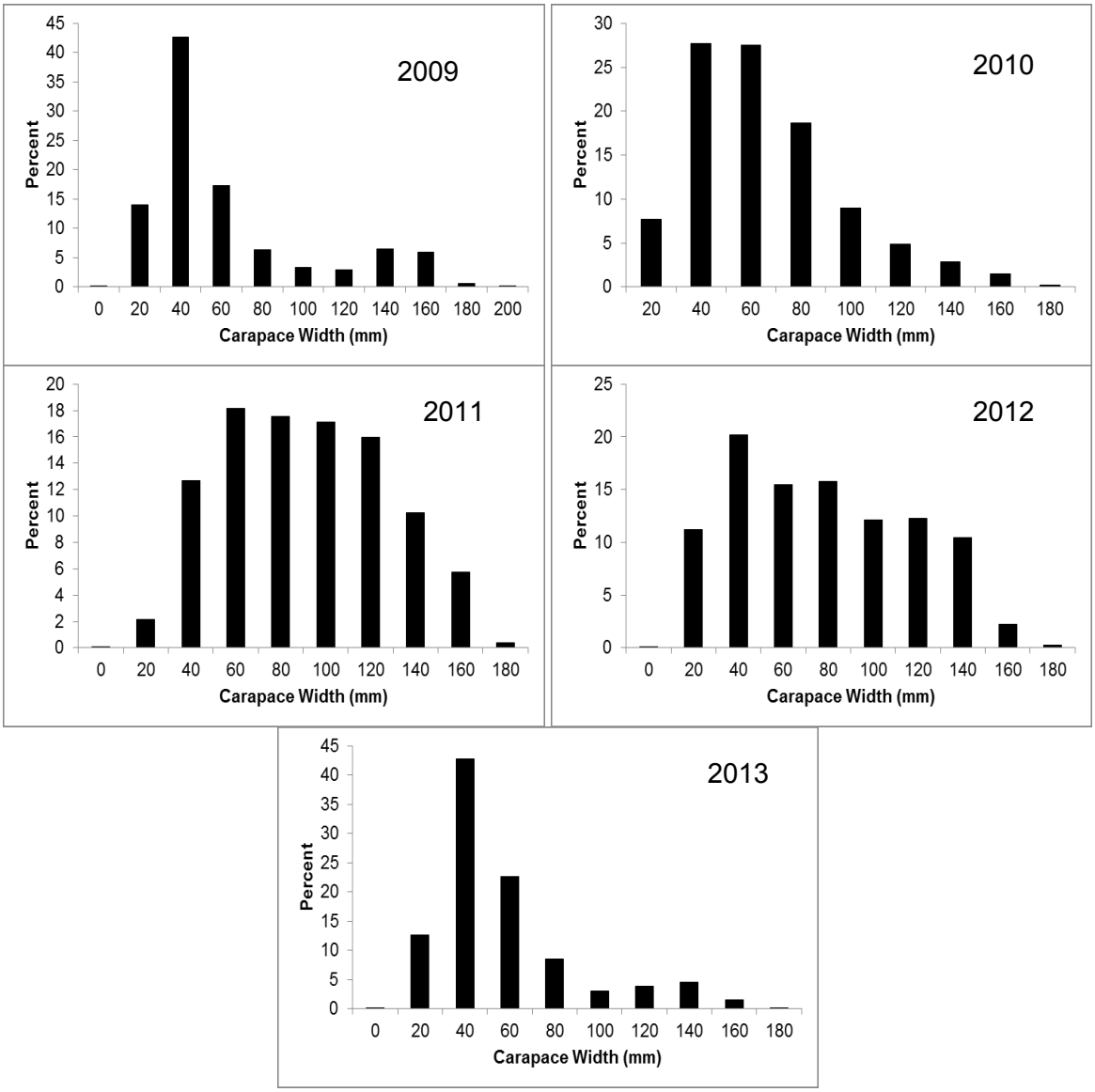

Figure 5. Expanded length frequency of blue crab for the 2009 - 2013 Pamlico Sound Surveys (N = 15,028).

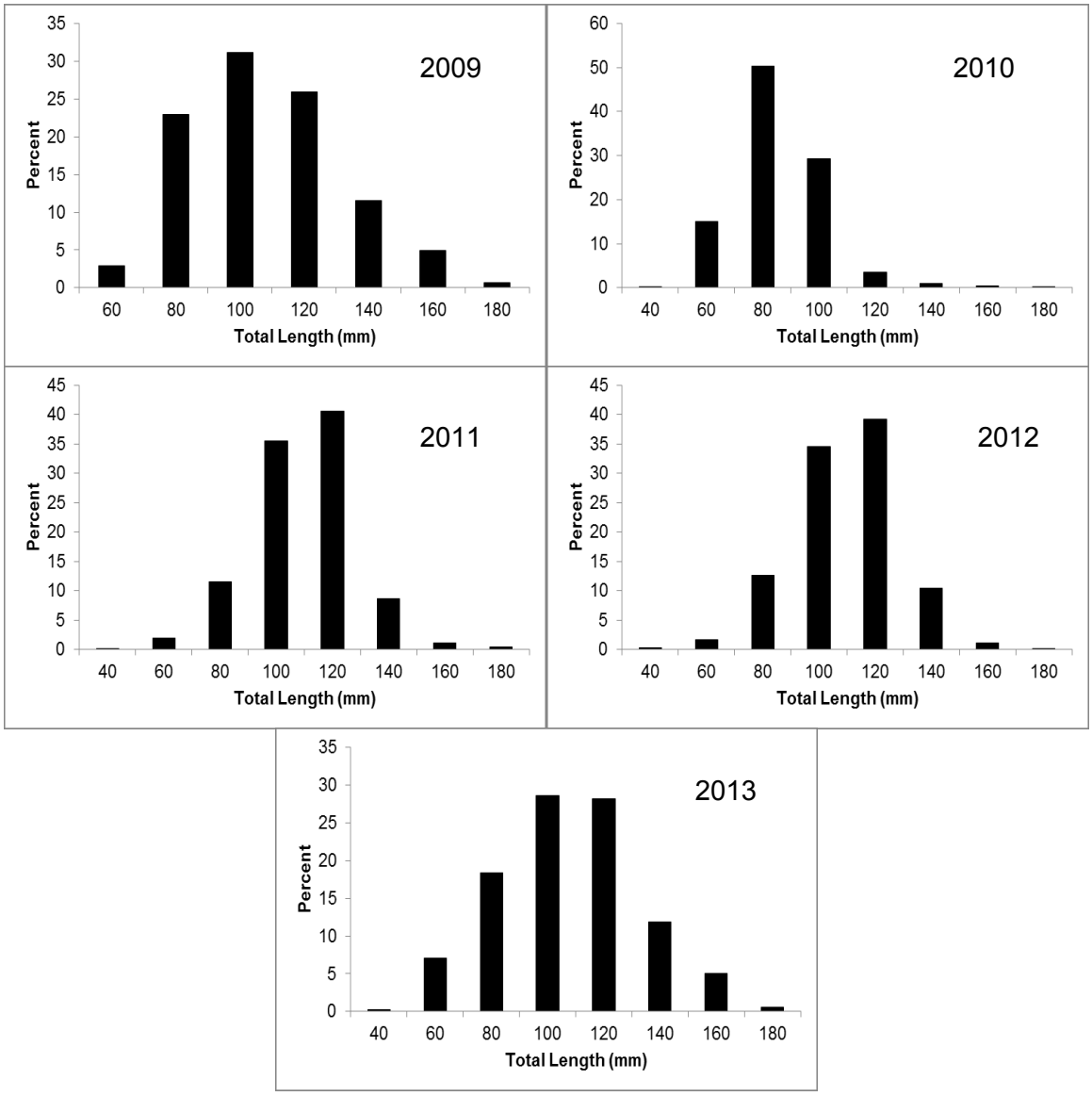

Figure 6. Expanded length frequency of brown shrimp for the 2009 - 2013 Pamlico Sound Surveys (N = 12,804).

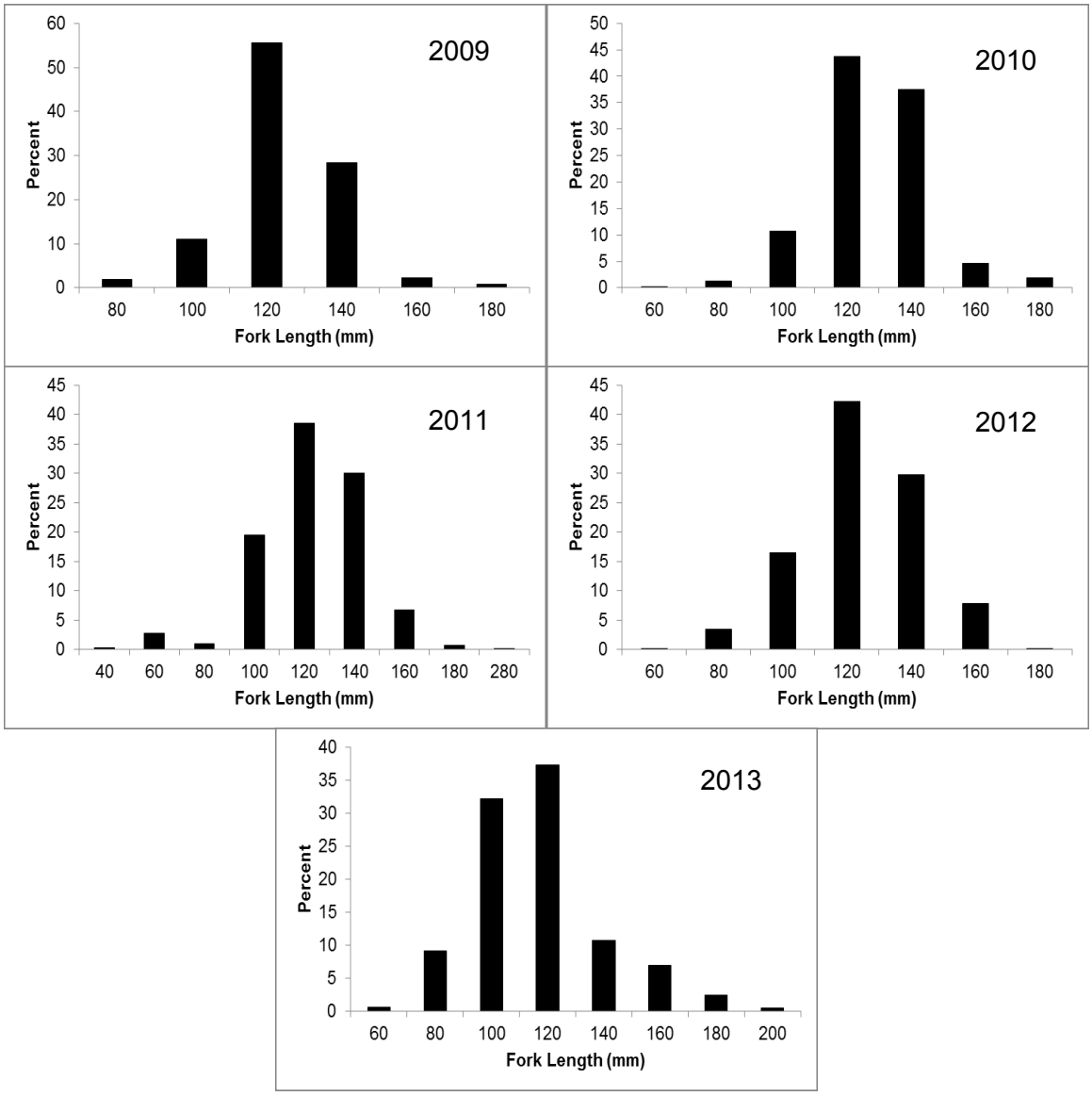

Figure 7. Expanded length frequency of pigfish for the 2009 - 2013 Pamlico Sound Surveys (N = 6,694).

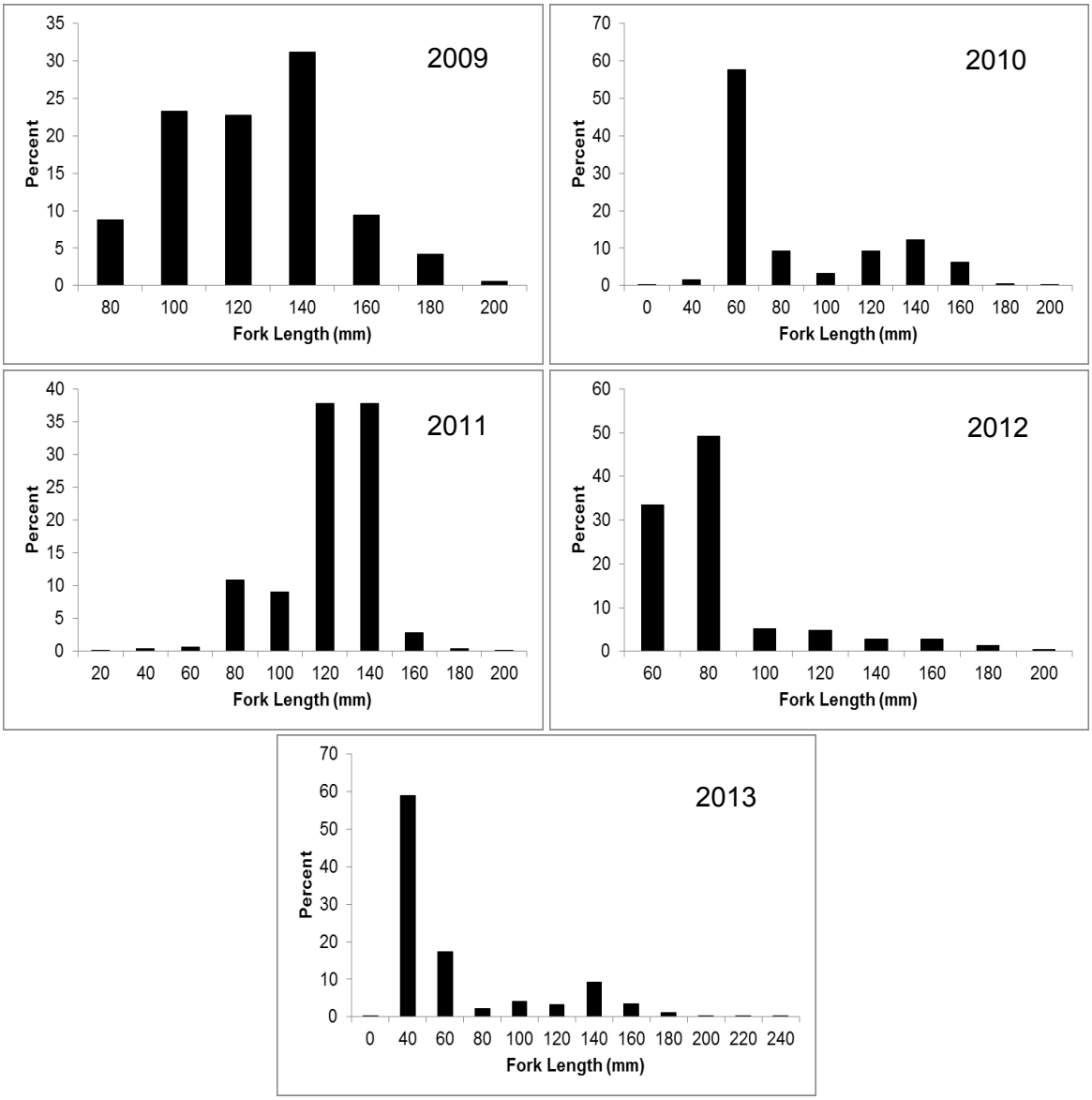

Figure 8. Expanded length frequency of Atlantic menhaden for the 2009 - 2013 Pamlico Sound Surveys (N = 12,718).

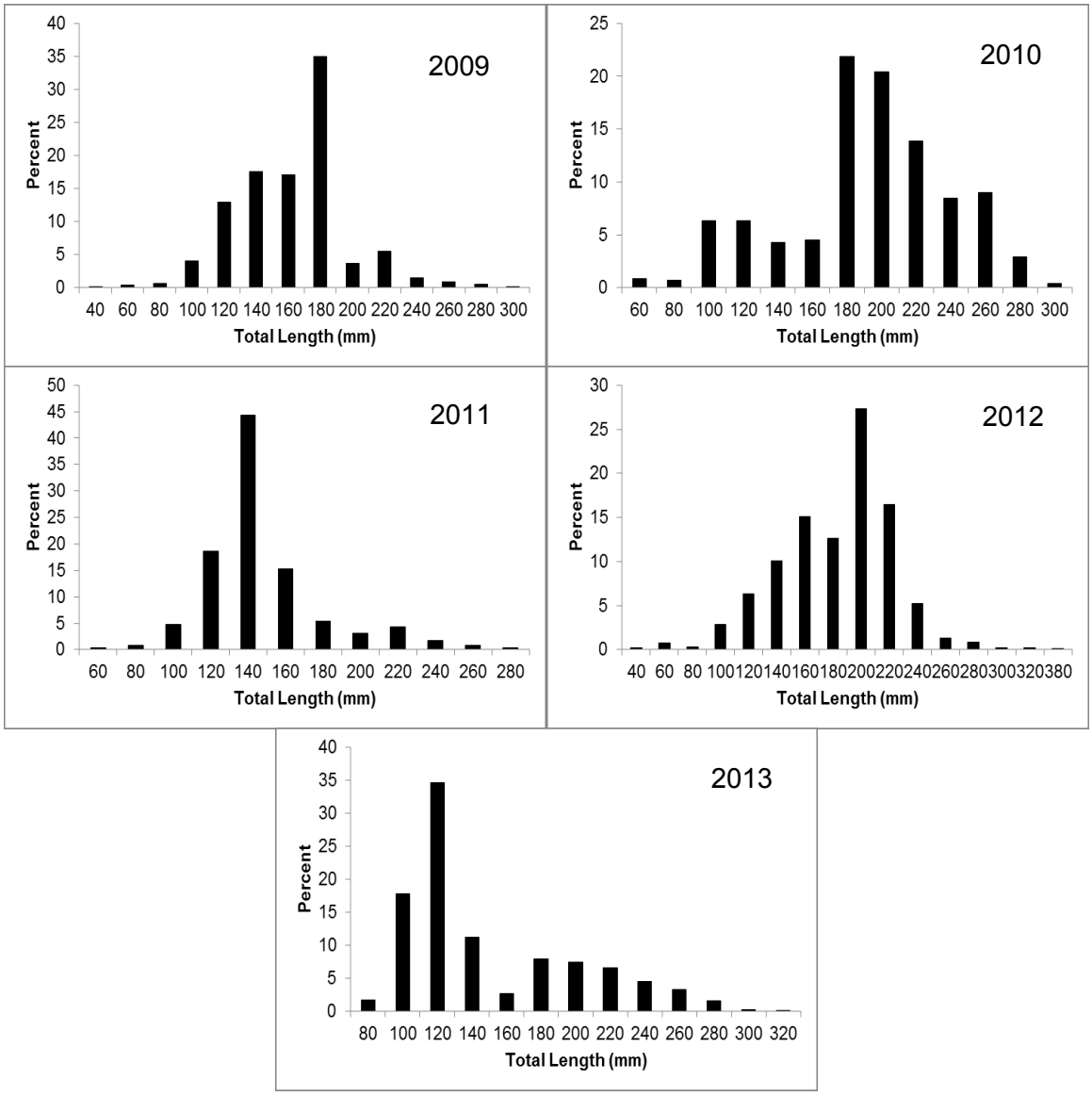

Figure 9. Expanded length frequency of southern kingfish for the 2009 - 2013 Pamlico Sound Surveys (N = 5,080).

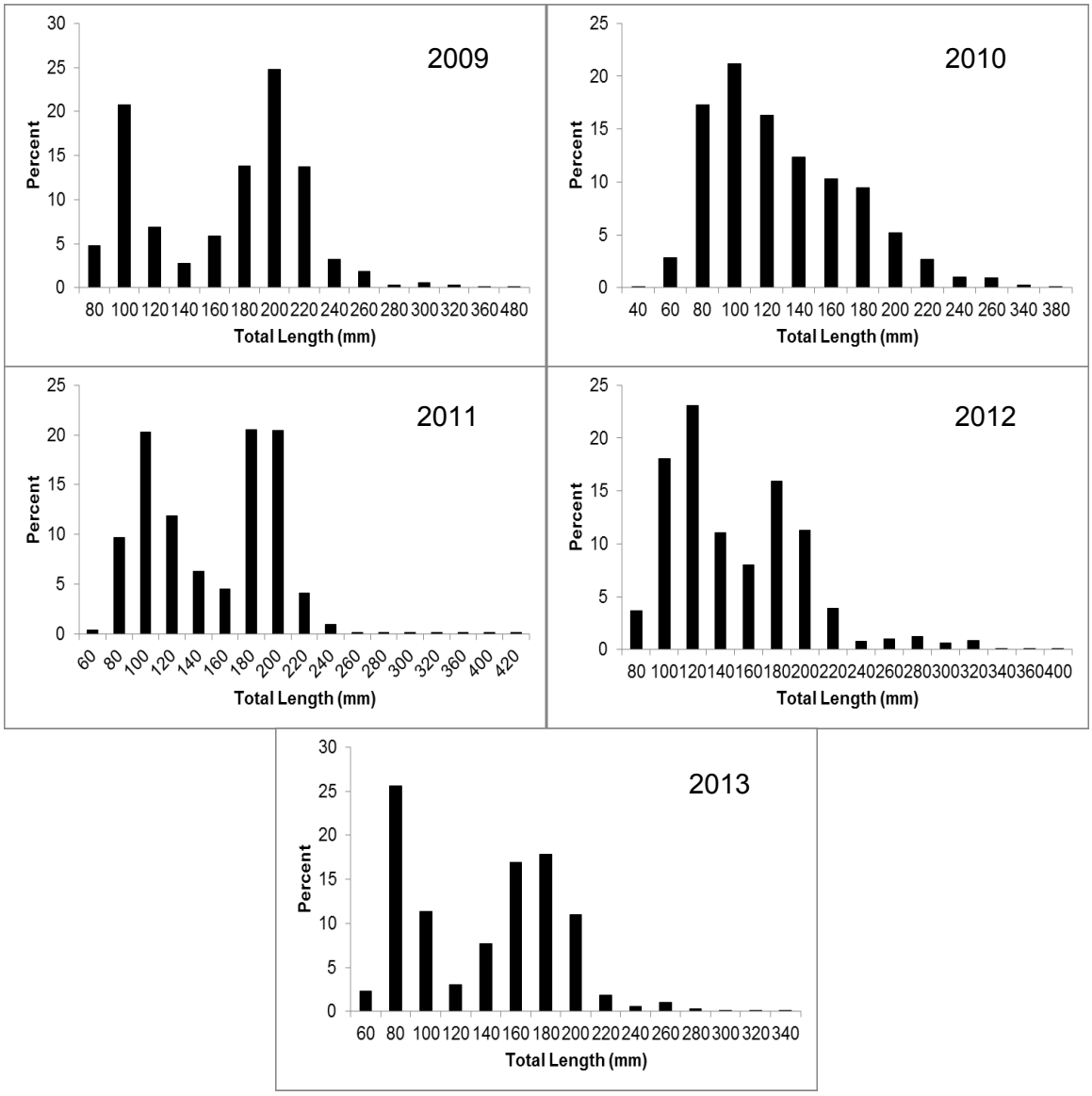

Figure 10. Expanded length frequency of summer flounder for the 2009 - 2013 Pamlico Sound Surveys (N = 4,527).

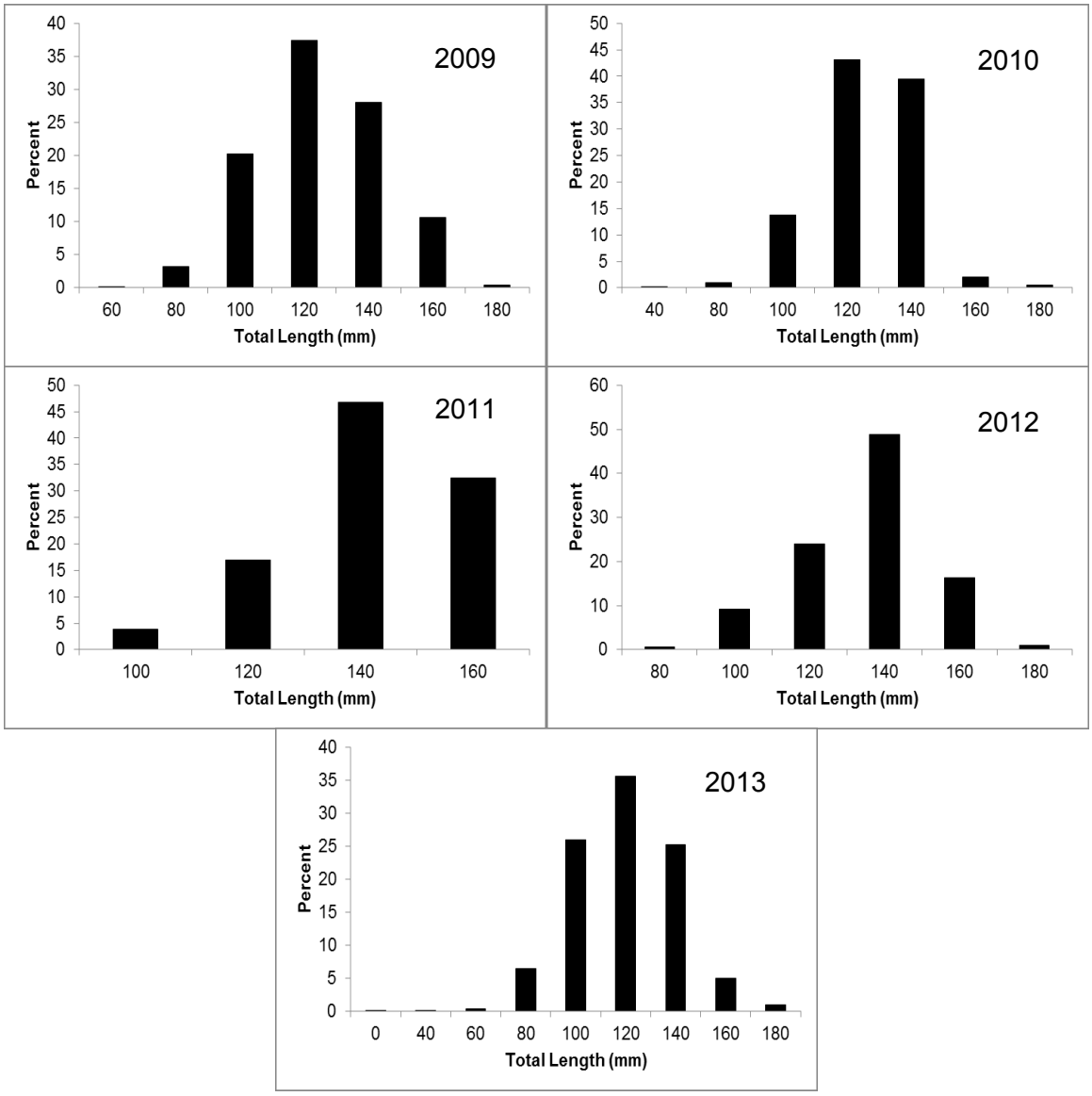

Figure 11. Expanded length frequency of white shrimp for the 2009 - 2013 Pamlico Sound Surveys (N = 3,455).

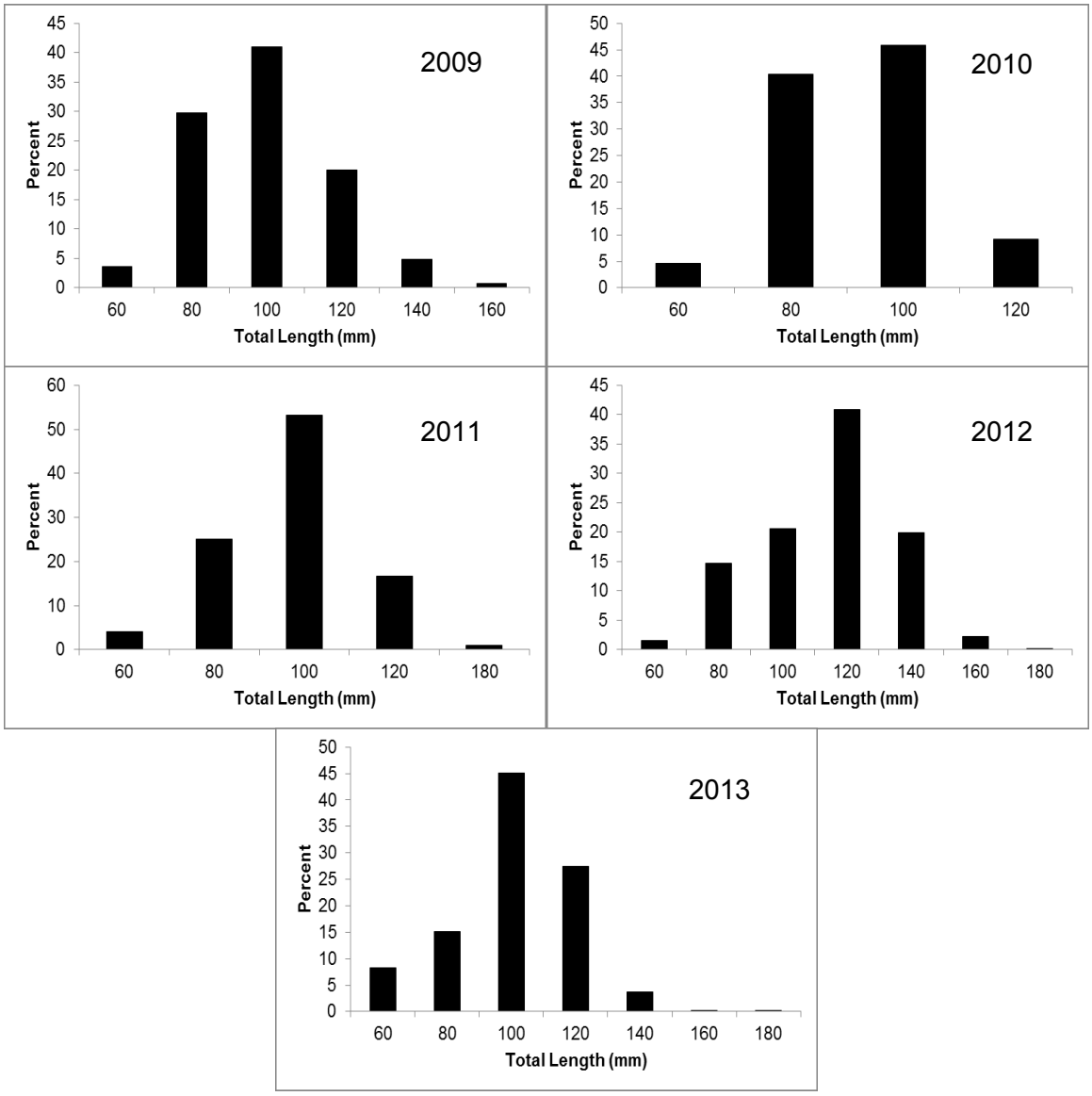

Figure 12. Expanded length frequency of pink shrimp for the 2009 - 2013 Pamlico Sound Surveys (N = 2,304).

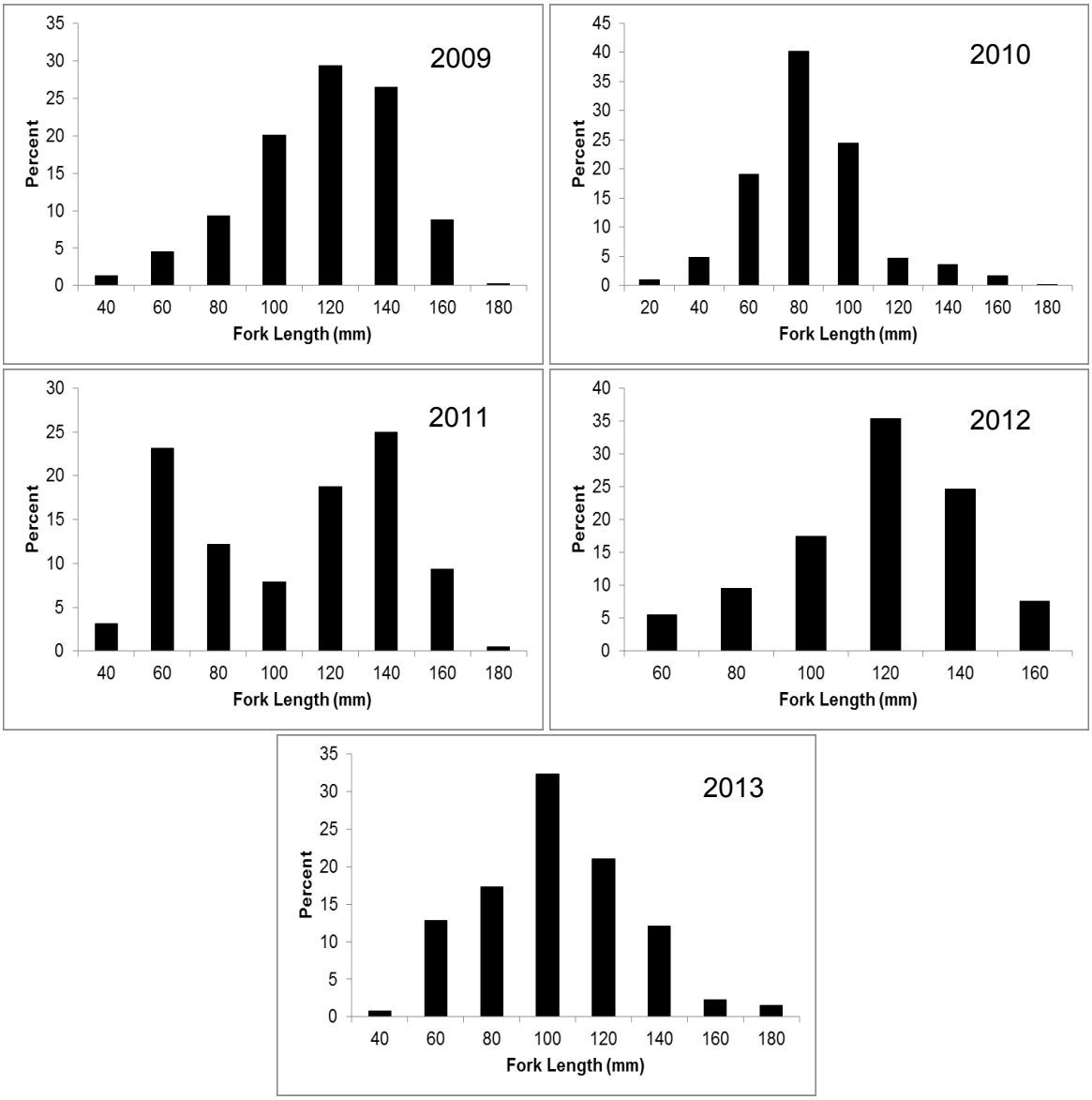

Figure 13. Expanded length frequency of butterfish for the 2009 - 2013 Pamlico Sound Surveys (N = 1,838).

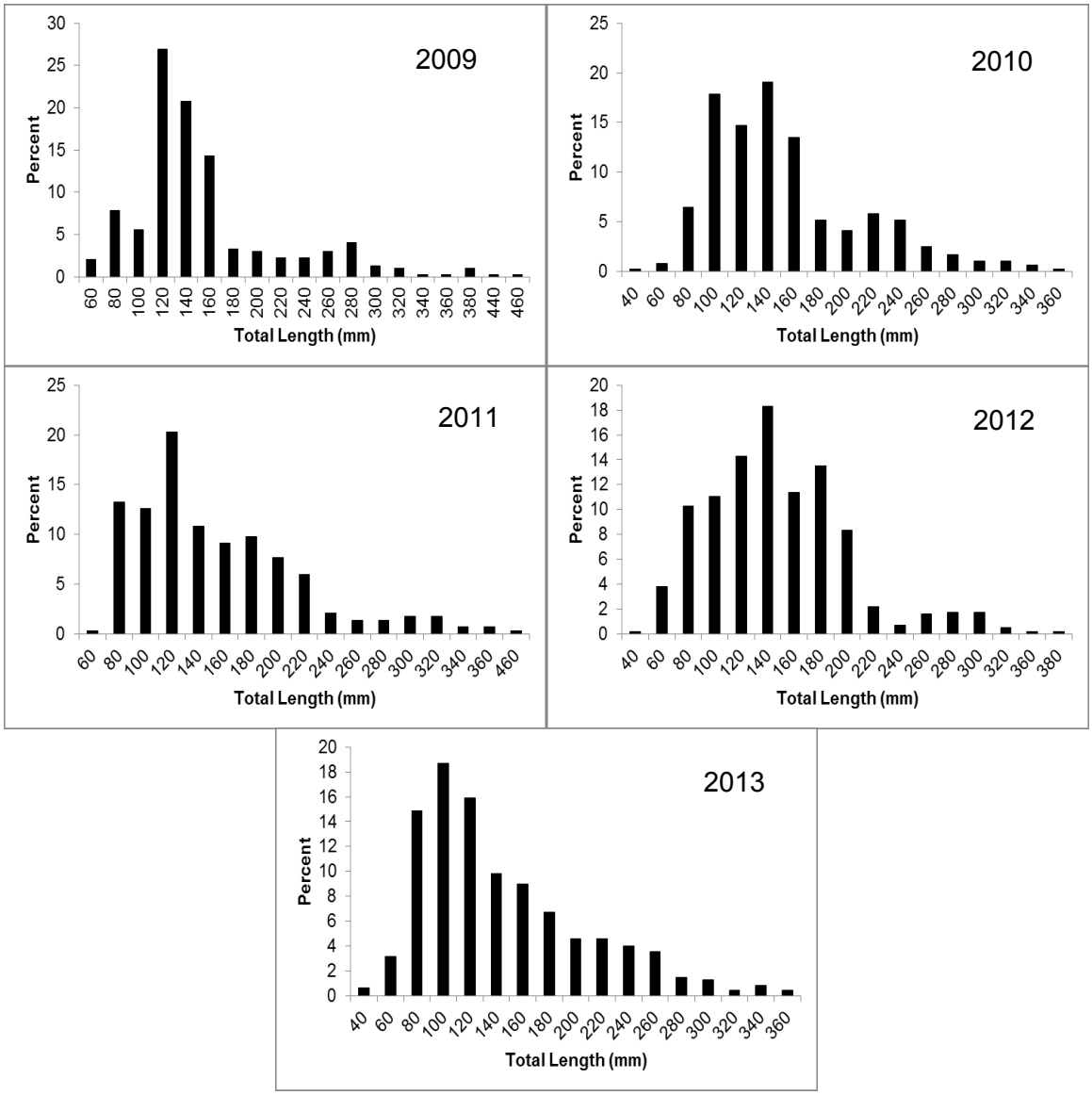

Figure 14. Expanded length frequency of southern flounder for the 2009 - 2013 Pamlico Sound Surveys (N = 2,219).

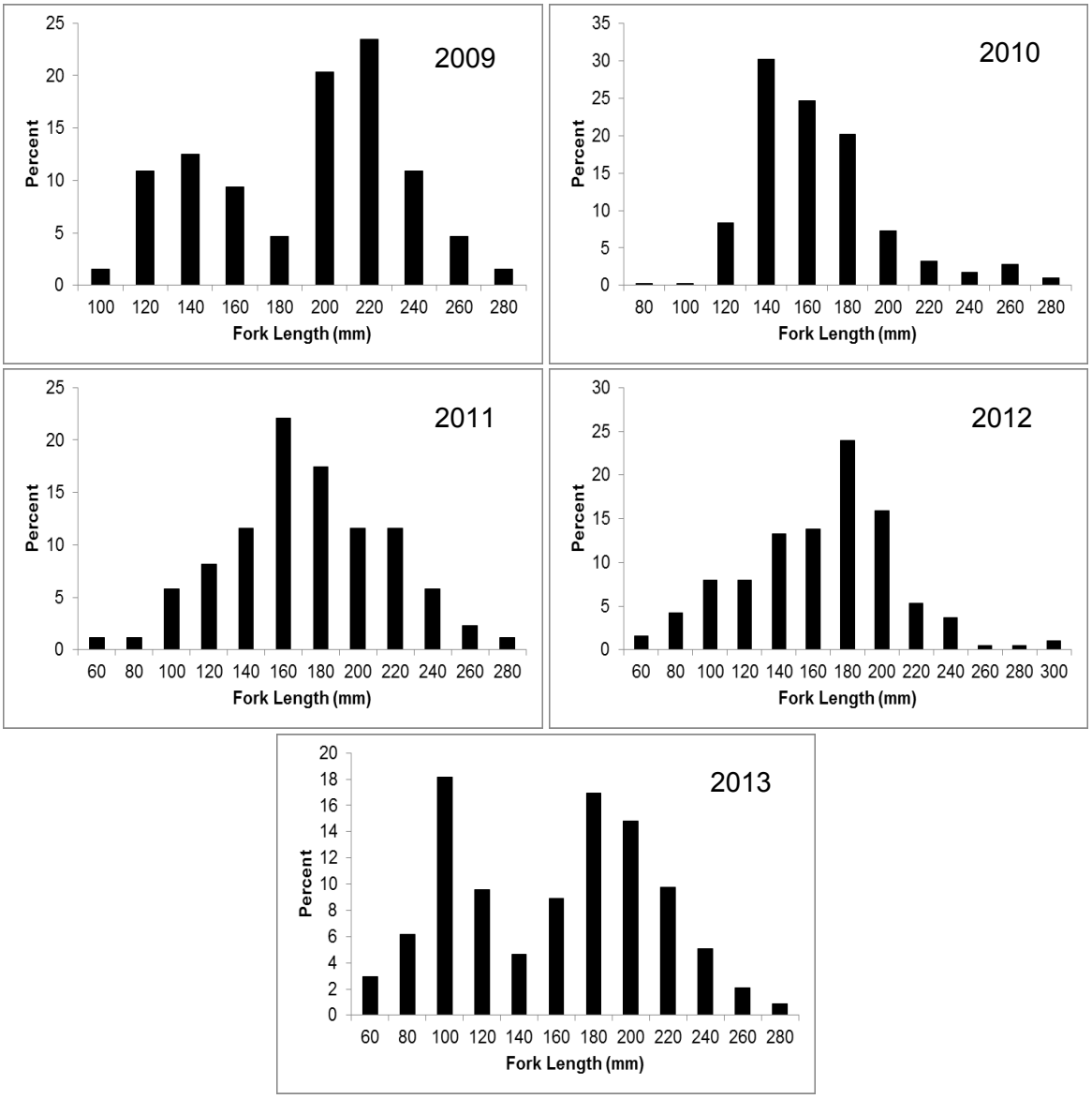

Figure 15. Expanded length frequency of bluefish for the 2009 - 2013 Pamlico Sound Surveys (N = 972).